New England Field Testing and Review Report

To Proposed Revisions of the Federal Manual for Identifying and Delineating Jurisdictional Wetlands

US Army Corps
of Engineers
New England Division

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(SCS, FWS, EPA, CENED)

FIELD TESTING AND REVIEW OF PROPOSED REVISIONS TO THE 1989 FEDERAL MANUAL FOR IDENTIFYING AND DELINEATING JURISDICTIONAL WETLANDS

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EXECUTIVE SUMMARY

1. FEWER WETLANDS DELINEATED

When applying the 1991 proposed revisions, 15 of 18 field-test sites across New England showed a reduction in wetland area, ranging from 5% to 100% with a median of 60% (see Table 1, Summary of Field Results). The Federal Register notice states that the proposed revisions are **not** intended to reduce jurisdiction, yet field test results show that a majority of plant communities and soil types traditionally viewed as wetlands in New England and recognized as such under both the 1987 Corps and 1989 Federal Manuals, such as red maple swamps, do not meet the criteria specified in the 1991 revisions. These areas provide society with important wetland functions and values that are necessary to accomplish the goals of the Clean Water Act.

The revised and more restrictive wetland hydrology criterion is no longer consistent with the annual duration of inundation or saturation needed to develop several of the hydric soil morphologies associated with prolonged wetness. Field soil scientists representing all six New England states agreed that all somewhat poorly drained and a majority of poorly drained soils would not experience 15 consecutive days of inundation nor 21 consecutive days of saturation to the surface during the growing season.

Based on this assumption, estimated percentages of currently listed hydric soils in several New England states that would not meet the revised hydrology criterion were calculated using published soil survey reports.

* Connecticut: 56%, representing a loss of about 256,000 acres of wetlands.

* Massachusetts: 41%, representing a loss of about 197,000 acres of wetlands.

* Maine: 60%, representing a loss of about 1,600,000 acres (this estimate represents only mapped portions of Maine, which is approximately half the state).

* Rhode Island: 48% (acreage figures not computed).

2. FIELD METHODS COMPLICATED

The Federal Register notice states that the proposed revisions are intended to simplify wetland delineations and make results more consistent and accurate, yet the revised criteria and field indicators are more complex and confusing to interpret and apply. This complexity and confusion will lead to more time-consuming and costly delineations as well as inconsistent jurisdictional determinations; results will not be reproducible in the field. The team estimates that the vegetation analysis using the point-intercept method requires 75% more time than the quadrat method currently used in New England.

3. CRITERIA AND FIELD INDICATORS INVALID

The proposed criteria are neither scientifically nor technically valid. For example, there is no justification offered for increasing the hydrology criterion to 15 consecutive days inundation or 21 consecutive days saturation during the growing season. This revised criterion is more restrictive than currently accepted science regarding the duration, frequency and seasonality of inundation or saturation necessary to develop hydric soils and hydrophytic plants. The proposed hydrology field indicators cannot be used to verify the revised criterion. In general, no field indicator can be used to verify a specific length of saturation or inundation (other than direct observation for the required time period). Also, the proposed growing season definition does not accurately reflect conditions in wetland systems, which maintain biological activity throughout much of the year.

4. INFERRED HYDROLOGY PROHIBITED

The proposed revisions require separate and distinct field documentation of the three criteria that define a wetland. These revisions effectively prohibit the use of hydric soils and hydrophytic plants to infer wetland hydrology. However, this requirement contradicts the well-documented interdependence of the soils, vegetation and hydrology which comprise wetlands. As hydric soils and hydrophytic plants are the direct expression of wetland hydrology, they will always provide the most reliable field indicators of that criterion.

5. MANUAL LACKS CLARITY

The appendices for problem and exception areas are disjointed, lack adequate explanation and description, and are mostly unrelated to the criteria, field indicators, and methods prerequisite for their application. It is unclear when, how, and under what circumstances to employ these provisions of the proposed manual. As a result, the team found that it was unable to utilize these appendices, and any community that failed to satisfy all three criteria was not delineated as wetland.

TABLE 1
SUMMARY OF FIELD RESULTS

Site	ST	Wetland Type	Est Change from 1989 to 1991	Criterion Causing Change		
				Hydro	Veg	Soil
TRI	CT	red maple swamp	-75%	x		
UMO1	ME	fir-tamarack swamp	-60%	x		
UMO2	ME	wet meadow	0%			
McD	ME	cedar-pine swamp	-60%	x		
LQR	MA	white pine swamp	-60%		x	
WEB	MA	red maple-laurel swmp	-65%	x		
PLI	MA	scrub-shrub swamp	-60%	x		
WIL	MA	wet meadow/agricultr	inconcl			
RBB	MA	silver maple floodplain	-30%	x		
EPP1	NH	red maple-pine swamp	-50%	x	x	
EPP2	NH	scrub-shrub swamp	-05%	x	x	
KEN	NH	red maple swamp	-30%	x		
BRF	RI	red maple-shrub swmp	-90%	x		
SAK	RI	red maple-shrub swmp	-80%	x		
BRR	RI	red maple-shrub swmp	-20%	x		
RUT	VT	wet meadow	-25%	x	x	
ADD	VT	emergent marsh	0%			
CAB	VT	cedar-fir swamp	-100%	x		

INTRODUCTION

On August 14, 1991, the federal government published in the Federal Register (56 FR 157, 08/14/91, pp. 40446-40479) a notice of proposed revisions to the 1989 Federal Manual for Identification and Delineation of Jurisdictional Wetlands. That notice sought public comment on the proposed revisions. Concurrently, the four federal agencies responsible for proposing the revisions, the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, USDA-Soil Conservation Service and U.S. Environmental Protection Agency, directed their respective field offices to perform field testing of the proposed revisions. This document contains the results of field testing by and recommendations of the New England Federal Interagency Team. The team -- consisting of representatives of those four agencies -- field tested the proposed revisions to the 1989 Federal Manual in accordance with the prescribed interagency field testing protocol.

Interagency Team Composition

The Federal Interagency Team consisted of the following personnel.

FWS: Wende Rosier
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Soil Conservation Service - Massachusetts

In addition to the team members, the CENED's technical writing consultant assisted at most sites. Also, several state wetland regulatory personnel, federal agency staff, and university personnel involved in wetland programs participated. These individuals are listed in Appendix A.

Field Site Selection and Testing Protocol

New England's highly variable topography and climate, combined with complex bedrock geology and recent glaciation, have resulted in a vast array of wetland types and sizes, ranging from extensive tidal marshes to various forested wetlands and peatlands. Soil conditions vary and often are complex, ranging from soils formed in marine silts and clays; stony and bouldery

glacial tills; stratified sands and gravels; loamy and silty alluvial sediments; and partially to well decomposed organic sediments. For this study, wetlands were selected to sample how the proposed revisions would perform in this wide range of landscape conditions. Other criteria in the selection of wetlands included prior knowledge of the site by regulatory personnel; availability of supplemental information, for example water table data; relative ease of visiting the site; and availability of landowner permission (see Table 2 for a list of sites and selection criteria).

A total of 18 sites were visited across the six New England states (Figure 1). At each site, wetland delineations were performed in accordance with the 1987/1989 and proposed 1991 criteria and methods. (In New England, implementation of the 1989 Federal Manual resulted in few actual changes to how and where wetland boundaries were delineated in comparison to the 1987 Corps Manual. Based upon its experience using both manuals, for the purposes of this field testing, the team assumed that the 1987 boundary was identical to the 1989 boundary.) The different soil/plant communities were identified at each site (see Figure 2). Typically, three communities (or units) were flagged: 1) uplands (community "X"); 2) wetlands according to the 1989 criteria (community "Y"); and 3) wetlands according to the proposed 1991 revised criteria (community "Z"). Plant communities were analyzed in the three units using the 1989 quadrat method, and soils were described within each community. Point-intercept transects were performed within each wetland plant community ("Y" and "Z") to generate mean prevalence index values. The interagency questionnaire supplied by headquarters was completed for each soil/plant community identified.


NEW ENGLAND
UMO(2)
MCD
CAB
ADD
RUT
EPP(2)
KEN
PLI
WIL
RBB
WEB
LQR
BRF
TRI
BRR
SAK

FIGURE 1.

Field Testing
General Protocol

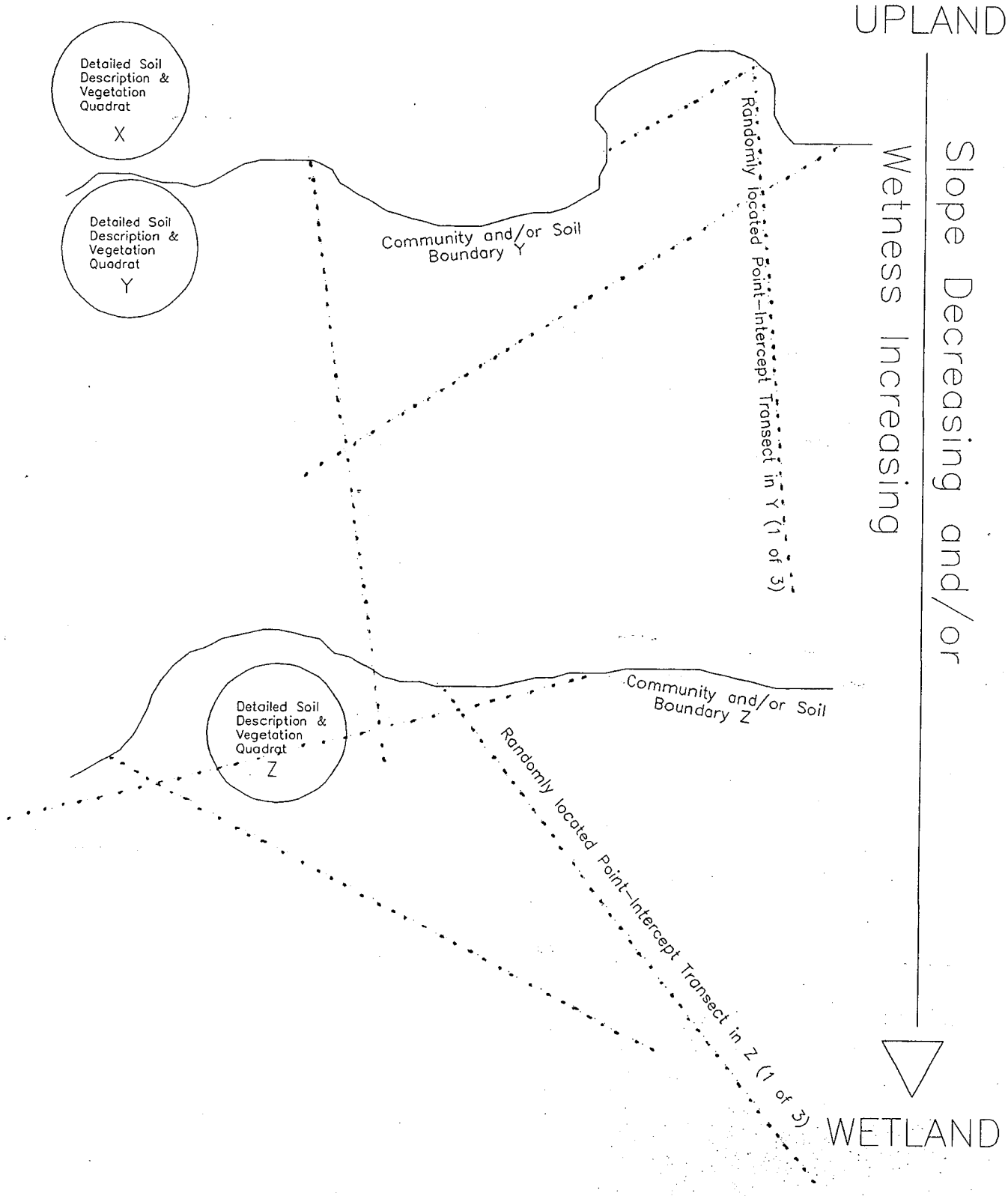


FIGURE 2.

TABLE 2
FIELD SITE SELECTION CRITERIA

Site Name	ST	Prior Delin.	Wetland Type	Other Considerations
TRI	CT	yes	red maple swamp	red parent material
UMO1	ME	no	fir-tamarack swmp	marine sediments; hi % clay
UMO2	ME	no	wet meadow	agric field; prior converted
McD	ME	no	cedar-pine swamp	evergreen forest
LQR	MA	no	white pine swamp	long, gentle till slope; limited monitoring well data
WEB	MA	yes	red maple-laurel swmp	shallow to bedrock complex; perched water table
PLI	MA	no	scrub-shrub swmp	coastal dune & swale
WIL	MA	yes	wet meadow	agric. field; prior converted
RBB	MA	no	silver maple floodplain	floodplain (Entisols); flood data
EPP1	NH	yes	red maple-pine swmp	evergreen forest; Spodosols
EPP2	NH	no	scrub-shrub swmp	valuable wildlife habitat
KEN	NH	no	red maple swamp	till slope; limited monitoring well data
BRF	RI	yes	red maple-shrub swmp	disturbed agric. area; prior converted
SAK	RI	no	red maple-shrub swmp	low chroma parent materials
BRR	RI	yes	red maple-shrub swmp	outwash/alluvial soils
RUT	VT	yes	wet meadow	seasonally variable hydrology
ADD	VT	no	emergent marsh	marine sediments; hi % clay; prior converted
CAB	VT	no	cedar-fir swamp	low chroma parent materials

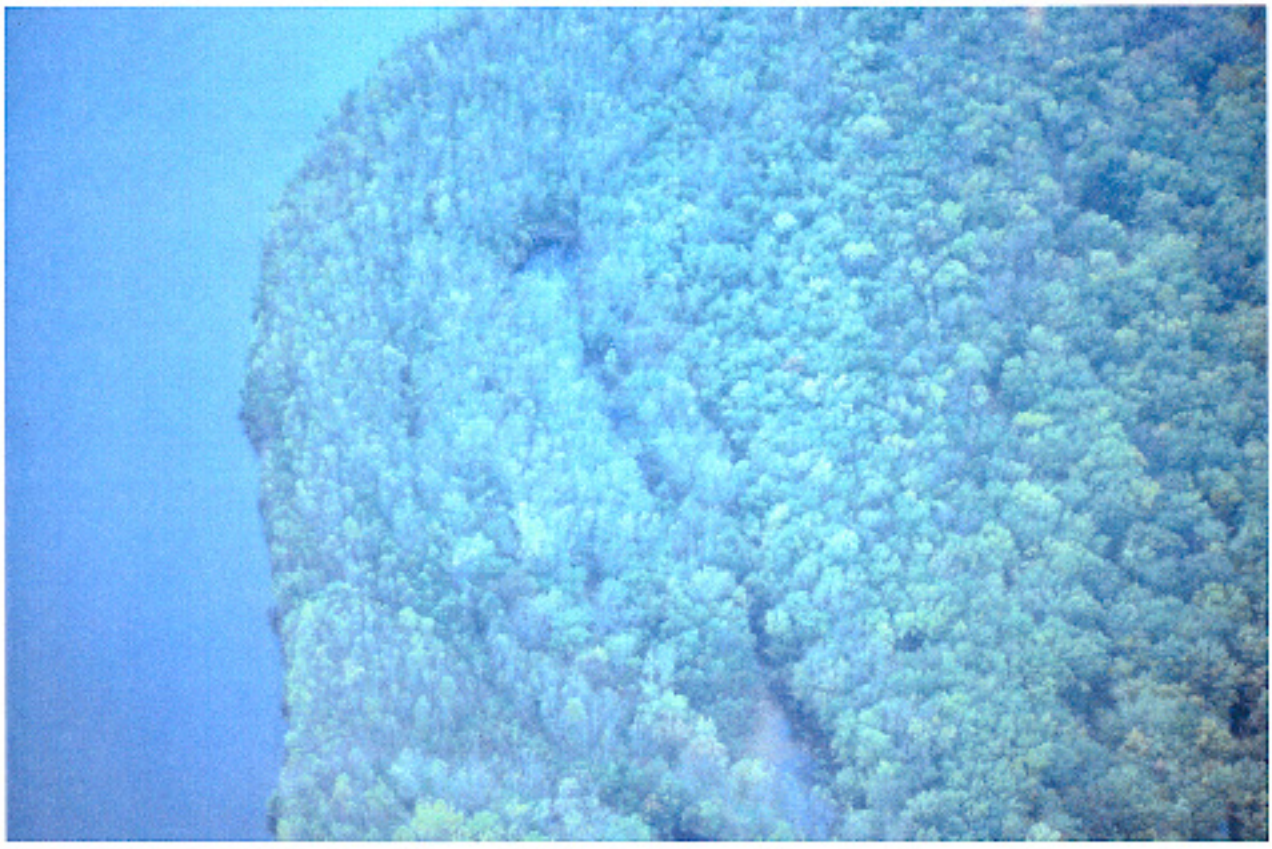
GOALS OF THE PROPOSED REVISIONS

In its section on Supplementary Information, the Federal Register notice mentions several goals of the proposed revisions. The team responds to these goals in turn.

Goal 1: To improve the Manual's accuracy for identifying and delineating wetlands. The 1991 proposed revisions substantially lessen the Manual's accuracy for identifying and delineating wetlands. With the changes to the criteria for hydrology and vegetation, and the rewording of the soil criterion (all explained in more detail in RESPONSE TO ISSUES), the 1991 draft leads one to identify wetlands and delineate their boundaries much farther down slope than previously occurred under both the 1989 Federal and 1987 Corps Manuals. In particular, the revised hydrology criterion and its field indicators are so restrictive that the draft Manual yields a positive wetland determination for only those wetlands which are saturated or inundated to the surface throughout most of the year. As the Federal Manual is supposed to identify and delineate wetlands which meet the regulatory definition found at 33 C.F.R. 328.3(b) and 40 C.F.R. Part 232.2(r), the proposed revisions fall far short of accurately identifying areas that meet that definition. In fact, the revisions appear to improperly redefine the term wetland itself.

Goal 2: To minimize the potential for erroneous wetlands determinations. The frequency of erroneous wetland determinations would increase with the proposed revisions. The changed criteria (especially hydrology); the confusing field indicators (particularly for the soil criterion); the inability to relate the results of several of the delineation methods to an individual criterion (e.g., vegetation); and, the inadequate explanation of problem and exception areas, would exclude extensive areas of land throughout New England traditionally viewed as wetland. As shown in Table 1, 14 of 15 wetland communities recognized by the 1987 Corps and 1989 Federal Manuals failed the proposed hydrology criterion.

Goal 3: Not to reduce jurisdiction, but rather to tighten the evidence required to document the three parameters in the definition of wetland: The 1991 draft does indeed tighten the evidence requirements for the three parameters, but in a way which is unscientific and impractical. The result is that the proposed revisions vastly reduce jurisdiction in New England. Field test results show overwhelmingly that a majority of plant communities and soil types historically viewed as wetlands even before the 1987 Corps Manual, such as red maple and white pine swamps in southern New England and eastern hemlock and balsam fir swamps in northern New England, would no longer meet the criteria specified in the 1991 revisions. In its field testing, the team found that these particular wetland systems suffered reductions in area ranging from 20% to 100%. These areas provide society with critically important wetland functions and values (e.g., flood storage and protection of drinking water supplies) that are necessary to accomplish the goals of the Clean Water Act.



The proposed manual abandons all but the wettest sites. Here only the deepest meander scars will be considered wetlands.

The proposed manual will relinquish regulatory jurisdiction at important margins which serve a full range of wetland functions.

Goal 4: To make it easier for federal and state agency staff to explain to landowners how wetlands are delineated: The 1991 draft produces exactly the opposite effect. The revised criteria and field indicators are far more complex and confusing to interpret and apply. Issues such as defining the growing season in relation to killing frost dates; the meaning of saturation or inundation "at the surface"; confirming "normal" rainfall years; and, inadequatley described problem and exception wetland types, among others, leave a great deal to be interpreted by the reader. Several sections of the draft Manual are disjointed and necessary connections between separate but related sections (e.g., methods and criteria) are not provided. This complexity and confusion will lead to more time-consuming and costly delineations as well as inconsistent jurisdictional determinations; results will not be reproducible in the field. Interpretations of the draft Manual will likely differ within particular agencies and almost certainly between agencies; these differing interpretations will be compounded by geographical differences across the country. State and federal agency staff will rarely be able to explain to landowners in a logical, simple fashion how wetlands are identified and delineated.

Goal 5: To maintain and improve the scientific validity of delineation methods. The methods in the 1991 draft remain substantially unchanged from the 1989 Federal Manual. However, the results of applying these otherwise sound methods are mostly unscientific and unreliable because of the changes to the criteria and field indicators, and other sections (e.g., appendix 8, Exceptions). The draft Manual does not yield reproducible results but instead appears more sensitive to the biases and experience of the individual delineator, time-of-year, and several other factors. These problems are explained in more detail in RESPONSE TO ISSUES.

RESPONSE TO ISSUES

Also in the section on Supplementary Information, the Federal Register notice requests comments on eight specific issues. The team responds to these issues in turn as well.

Issue 1: Seasonally harder to identify wetlands. The team agrees that for the Federal Manual to be valid and useful, it must allow accurate wetland determinations at any time of year, in any year. However, as proposed, the revisions will almost certainly yield different results (i.e., different wetland boundaries) at different times of year. These inconsistent results will be caused chiefly by the changes proposed to the hydrology criterion and its field indicators. The team found that the proposed field indicators cannot be used (at least during mid to late summer) to verify the revised criterion of 15 consecutive days of inundation or 21 consecutive days of saturation at the surface. Moreover, the team believes that no field indicator can verify a specific length or frequency of saturation or inundation (other than direct observation for the required time period). For the purposes of testing the proposed revisions, however, the team assumed that observing the given field indicators of hydrology did verify the hydrology criterion, unless local experts provided evidence to the contrary.

Consequently, the team recommends a modification of option 3. Best professional judgment should be allowed when seasonal variations prevent or restrict reliable observation and interpretation of field indicators. The key point is not that an area fails to meet all three criteria, as the draft Manual puts it, but that due to seasonal or yearly variations, field indicators for a particular criterion (hydrology, most often) cannot always be observed and interpreted. The manual should simply recognize the reality that direct observation of hydrologic or vegetation field indicators at certain times of year in some wetland systems is impossible. Moreover, for the hydrology component, revised and refined field indicators of wetland hydrology would allow accurate and reliable identification throughout the year (recommendations for New England are provided in CONCLUSIONS AND RECOMMENDATIONS).

Issue 2: Secondary field indicators of wetland hydrology. Several of the secondary indicators listed in the proposed revisions, namely, silt marks, drift lines, debris, and surface scouring, merely indicate the occurrence of an event and are unreliable as indicators of duration and frequency of hydrology. In addition, several of the proposed methods for documenting hydrology (e.g., aerial photography, monitoring wells) are extremely difficult to apply and do not reflect real situations of limited time and resources. Moreover, where these types of information may exist for a particular wetland site, they are not readily obtainable. Although reliable flooding or water table data are valuable tools for documenting the hydrology of a particular site, it is impractical to require such data in most cases. It is only practical to make field observations which indicate events and, to a lesser degree, duration.

More generally, most mapping products (e.g., National Wetland Inventory maps, Flood Insurance maps) and aerial photographs do not provide sufficient detail or data quality to be used for documenting or corroborating the hydrology of a particular site. While maps and

photographs may provide valuable information such as elevations, plant canopy cover types, and land uses, they provide little direct and reliable information about the specific length of time that a site might be inundated or, especially, saturated.

Further, the blanket provision for corroborating secondary indicators by consulting "reliable persons with local knowledge of inundated and/or saturated conditions" defies accepted scientific practice: it is arbitrary and open to much interpretation and mischief. A person's reliability and/or local knowledge may not easily be verified, and allowing unqualified evidence of that sort compromises the scientific validity of the process. In addition, determining when corroborating evidence is sufficient to support secondary indicators would likewise prove arbitrary.

The team believes that field indicators of hydrology should not be separated into primary and secondary categories. Rather, a single list of field indicators should be provided with appropriate precautions against misinterpretation. Regionally adjusted lists would likely prove even more reliable. See CONCLUSIONS AND RECOMMENDATIONS for the team's suggestions.

Issue 3: Exception wetland types which fail to meet all three criteria. The term "Exceptions" is inappropriately applied here. These wetland systems should be listed as "Specific Regional Wetland Types," or some similar title. In New England, these wetland types constitute the norm and are distributed far too widely to describe them accurately as exceptions. Moreover, the terminology used in appendix 5 of the 1991 draft is vague. Terms like "white pine bogs," "eastern hemlock swamps and bogs" and "tamarack bogs" mean different things in various parts of the country. If this list of so-called "exceptions" is retained, the following types should be added: Swamps dominated by (a) red maple alone or in combination with white ash, yellow birch, and/or grey birch; and (b) balsam fir and red spruce, typically in combination with northern white cedar, red maple, grey birch and/or eastern white pine. Further, these wetland types must be described in sufficient detail to allow clear and reliable identification in the field. Anything less will promote widespread, varying interpretations and inconsistent results.

The draft Manual references Tiner (1991) in recognizing the existence of plant "ecotypes," that is, individuals or populations that, though typically occurring in uplands, have adapted to life in saturated soils. However, the draft only recognizes certain specific wetland types where this phenomenon occurs. In New England, these wetland-adapted ecotypes frequently exhibit features such as shallow rooting, fluted trunks, and disproportionate growth size to age (growth rings) in comparison to individuals of the same species growing in upland settings. When growing on undrained hydric soils, <u>any</u> individual or population exhibiting these or similar features are operating as hydrophytes. Therefore, the Manual should recognize this general phenomenon and not unjustifiably limit its utility to certain "recognizable wetland types."

The prevalence index measure is not a useful means for delineating wetland boundaries (see the section on OTHER ISSUES for a complete discussion of the team's findings on this subject). The team supports using only the dominance measure as the vegetation criterion. In these

exception areas, it may be appropriate to allow best professional judgment to alter the wetland indicator status of ecotypes when gathering vegetation data in the field (e.g., eastern white pine trees exhibiting fluted trunks and shallow roots, and growing on hydric soils, would be tallied as facultative wetland rather than facultative upland).

Issue 4: Status of delineations based on the 1989 Federal Manual. Reopening completed enforcement cases poses several complex legal issues. The team strongly recommends that completed enforcement actions not be reopened for redelineations.

Issue 5: Validity/utility of the FAC-neutral test. (Though the FR notice mentions on page 40448 that the procedures for implementing the FAC-neutral test can be found in the appendices to the draft Manual, those procedures were not found in any appendix. The team referred to the headquarters testing protocol (questionnaire) for guidance and used best professional judgment to apply this test.) Generally, the FAC-neutral test and its variations do not save time. Test results show poor correlation between the FAC-neutral test and the results of both the dominance measure and prevalence index thresholds; hence, the team resorted to more detailed analysis in most cases. Of the 33 wetland plant communities where vegetation data was gathered (2 wetland plant communities for each of the eighteen field sites visited; plant data was incomplete or ungathered at 3 communities), the team was able to apply the FAC-neutral test in 27 of 33 instances (82%). In those 27 instances, the FAC-neutral test result agreed with the dominance measure result 20 times (74%) and the prevalence index result 19 times (70%). Since the premise of applying the FAC-neutral test is to save time as an alternative to the point-intercept method (prevalence index measure) and test results show poor correlation, the team believes the FAC-neutral test is not reliable.

Applying the FAC-neutral test or one of its variants to plant data gathered to assess dominance as measured by percent areal cover and basal area is not technically valid. As described in the draft Manual, the FAC-neutral test is a simple comparison of numbers of dominant species with certain wetland indicator status; however, it is inappropriate to make this comparison from data which measures percent areal cover and basal area. In doing so, the data is used in a manner not intended, leading to flawed comparisons. For example, quadrat data which finds that a site is dominated by 7 species (1 OBL-FACW/3 FAC/3 FACU-UPL) would yield a 4/7 (57%) FAC or wetter result and a positive determination that the plant community is hydrophytic. Using FAC-neutral, the result would be 1 wet to 3 dry, thus the result would be negative. However, it is quite possible that the 1 wet species is a tree that occurs as 20 individuals within the sample plot and was assessed as 85% dominant in the canopy, while the 3 dry species are all herbaceous that occur as less than 20 individuals total and were assessed as 30% dominant each for that stratum. In terms of ecological significance (i.e., dominance), the 1 wet tree species more strongly reflects the prevailing environmental conditions at the site (e.g., hydrology). Therefore, the FAC-neutral test yields an erroneous result.

Furthermore, the underlying concept of designating facultative species as neutral is not scientifically valid. It is to be expected that facultative plant species will predominate in the landscape position where many wetland boundaries are delineated. To ignore them is to ignore

a significant ecological indicator of conditions at that landscape position. Where facultative species predominate, it tells us that hydrologic conditions vary at that landscape position; one must therefore investigate both indicators of hydric soil and hydrology to accurately determine whether the site is a wetland. If hydric soils and wetland hydrology exist, then these facultative species are operating as hydrophytes (in the absence of significant hydrologic modification). Since these species indicate the presence of a hydrophytic plant community, discounting them as neutral could lead to incorrect wetland determinations. Therefore, we strongly recommend deleting the concept of FAC-neutral from further editions of the Manual.

Issue 6: Use of hydrologic records to document the hydrology criterion. While it may be a valid scientific approach, acquiring three years of hydrologic records to document the wetland hydrology criterion is impractical. Reliable and appropriate monitoring data rarely exist for specific wetland sites. Where they do exist, an inordinate investment of time and resources is generally necessary to locate and obtain them. Use of hydrologic records as a primary method to document wetland hydrology poses especially acute problems in enforcement cases. While the provision for prospective monitoring of hydrologic conditions at a particular site is acceptable, the team was unable to assess the scientific validity or utility of the proposed procedures due to the limited review period provided.

The requirement that water table data come from three "normal" years in both amount and monthly distribution and be correlated with long term hydrologic records for specific geographical areas makes this method unworkable (Golet, 1991). In New England, seasonal distribution of precipitation varies widely among years and during any particular year. Whether the requirement for acceptable data on annual rainfall and monthly distribution is 90% of their respective averages or some lesser threshold is likely irrelevant. By choosing other percentages or thresholds, we arbitrarily redefine "normal," thus gaming an otherwise valid methodology to suit a particular need. The inescapable truth is that these data will rarely be available from prior monitoring and, for prospective cases, will prove extremely costly and cause unacceptable time delays for applicants. Techniques for "normalizing" hydrologic should be recommended as guidance rather than prescribed as mandatory.

In any event, on-site observations of the field indicators of hydrology should remain the primary means of satisfying the hydrology criterion.

Issue 7: Alternative approaches for easily recognized and/or especially valuable wetlands. When reliable maps or photographs are available, these resources should normally prove adequate for a positive determination that obvious wetlands exist at a particular site. However, the converse is not true: the lack of positive evidence from maps or photographs is merely inconclusive and a field determination will likely be necessary. In any event, an office determination that wetlands exist at a site does not allow precise identification of wetland boundaries, which can only be established by a field determination.

While it is technically and scientifically feasible to identify the presence of easily recognized wetlands or those of overriding significance, advance identification and especially delineation of these wetlands would prove extremely costly, resource intensive and/or controversial in deciding which and what types of wetlands to include. In addition, such an exercise could only capture a particular moment in time; as wetlands are dynamic resources, maps would require periodic and careful revision. Regardless, off site procedures can never replace field determinations for establishing precise and accurate wetland boundaries for regulatory purposes.

During its testing, the team visited several agricultural properties where office determinations had been performed by federal agency personnel. Office determinations did not correlate with actual field results. Personnel performing these determinations cautioned against reliance solely on off-site delineation methods.

Though the team does not encourage it, if an off site process similar to the proposed concept is implemented, it should be overseen and conducted by the appropriate regionwide scientific and regulatory agencies. The process should be open to public comment.

The team does recommend that field procedures be simplified for identifying obvious wetlands and uplands. The methods contained in the 1989 Federal Manual pertaining to this issue should be reinstated. They are scientifically and technically valid; more importantly, the team's experience is that they are practical and yield reliable, reproducible results.

Issue 8: Definition of the growing season. With the advances in wetland science during the last few years, the concept of growing season has come under greater scrutiny. In short, the concepts of growing season contained in the 1989 Federal Manual and in the proposed 1991 revisions for agricultural and upland plants do not parallel that for wetland systems. Recent literature and studies (Tiner, 1991) show that hydrophytes continue biophysical activities throughout much of the year, and hydric soil development occurs over these extended periods as well. Hydric soils tend to remain warmer longer than adjoining upland in fall or early winter; likewise, hydric soils thaw quicker and earlier in late winter or early spring. In addition, hydric soils tend not to freeze as deeply or as thoroughly as upland soils during winter months. While plant life processes and hydric soil development may occur at slower rates during colder periods, these events proceed nonetheless. The wetland growing season should now be recognized as extending throughout most of the year, essentially occurring anytime the upper part (root zone) of the soil is unfrozen. See CONCLUSIONS AND RECOMMENDATIONS for the team's suggested revision to the hydrology criterion.

OTHER ISSUES:

The team identified several additional issues of concern.

Time and Cost: Applying the revised Manual will take longer and cost more, yet will not yield reliable results. The point-intercept method for determining the presence of a hydrophytic plant community is a laborious process. At least three transects per community must be performed and, rather than dealing with dominant species, the delineator must devote more time to identify a much greater proportion of plant species encountered. In meadow situations, the point-intercept method can prove extremely time consuming. In its field testing, the team found that it spent about 2 ± person-hours per transect. The cost of delineating wetlands will dramatically increase; this increase will often be borne by applicants.

The revised field indicators for determining hydric soils require in many cases that the delineator classify the soil to series level. Classification typically requires more detailed profile description, a substantial level of expertise in soil science, and significant time. Focusing on soil morphological features related to an aquic moisture regime is more efficient and yields comparable results. Further, the concept of soil series varies markedly. A recent study (Nettleton, Brasher and Borst, 1991) found that approximately 75% of mapped soils encountered in the field fell outside the taxonomic bounds for their particular series, i.e., they were taxadjuncts. Without specific knowledge of local soil series, classifying soils to this level would require greater expenditures of time and still be subject to a high degree of error.

The provision for monitoring the hydrologic regime of a site to determine compliance with the hydrology criterion may be legitimate, however, it is impractical. The delay to acquire three years of "normal" data and the costs involved would likely prove prohibitive for most applicants, and would be completely unworkable in enforcement situations where the need to make a rapid determination is often necessary to halt further illegal discharges.

Under the draft Manual, the team believes that delineators would be pressured to "cut corners" to save time and effort, aggravating the erroneous wetland determinations and boundaries.

Point-Intercept Method/Prevalence Index: While the point-intercept method is a suitable approach to characterizing an entire plant/soil community, it generally is not practical for delineating wetland boundaries. Boundary delineation must concentrate on the edges of communities; since they are randomly located, point-intercept transects may often lead the delineator into the interior of communities and far from the edge, never capturing data that accurately defines that edge. Also, because location of transects and data acquisition are random, results are not easily reproducible in the field. On the other hand, discretely located transects and quadrats are reproducible and allow the delineator to focus on the edges of communities to determine a wetland boundary.

The FR notice contains no justification for the revision to the vegetation criterion. The revised prevalence index threshold of "less than 3.0" removes facultative species from consideration in determining the presence of a hydrophytic plant community. Compared to the dominance measure threshold (>50% of dominant species are FAC, FACW or OBL) contained in the 1987 Corps and 1989 Federal Manuals (and presumably still found on the field data sheets for the 1991 draft, thought these data sheets were not included in the FR notice), this revision represents a major change. In New England, a large portion of traditionally recognized wetlands are dominated by facultative species (e.g., red maple, balsam fir, grey birch). The proposed revision effectively redefines these wetlands as upland unless they qualify as an exception.

Wetland Hydrology Criterion: The FR notice similarly contains no justification for the revised hydrology criterion. The revised criterion is more restrictive than currently accepted science regarding the duration, frequency and seasonality of inundation or saturation necessary to develop hydric soils and hydrophytic plants. The team emphasizes that the revised criterion is not scientifically defensible. In his comments on these proposed revisions, Golet (1991) reports that the hydrology criterion was not met at all 38 monitoring wells placed in poorly and very poorly drained soils at study sites in Rhode Island. Moreover, Golet found that surface water was present on the very poorly drained soils less than 2% of the growing season, and that the poorly drained soils never had water at the surface. This study monitored water tables for three consecutive years (1985-1987).

If the Manual is to allow year-round determinations in most circumstances, it is counterproductive to prohibit use of hydric soil morphology to infer the presence of the water table in the upper part of the profile.

In addition, the revisions require documentation of water "to the surface" for the specified time periods. Again, there is no justification provided for this change. Wetland hydrology should be documented within the upper part of the soil profile where the majority of plant roots occur, not restricted "to the surface" as required in the 1991 proposed revisions. Documenting a water table within 12 and 6 inches of the surface in non-sandy and sandy soils, respectively, accurately accounts for the zone of effective saturation in the upper part due to capillary rise.

Hydric Soil Criterion: The proposed hydric soil criterion, the steps for field verification, and the accompanying background discussion on hydric soil characteristics are often inconsistent, technically incomplete, and overly simplified. As stated, they are difficult to interpret and apply in the field and may lead to inconsistent and inaccurate hydric soil determinations.

Several of the criteria (items 1, 2, and 3) listed within the Hydric Soil Criterion section of the proposed revisions are repetitive and, in some instances, represent an incomplete subset of the nationally accepted criteria for hydric soils (item 4) developed by the National Technical Committee on Hydric Soils (NTCHS). By having two, differently worded explanations which define the same criterion, i.e., one contained in the proposed 1991 revisions and the other contained in Hydric Soils of the United States, wetland regulators and delineators will be confused and delineations will likely be inconsistent.

The proposed revisions describe three steps for field verification of hydric soils: 1) using soil series; 2) using soil taxonomy; and, 3) using regional indicators of significant soil saturation. For an individual to apply any one of the three steps in the field would require an extensive technical soils background, substantial field experience, and a significant amount of time. Moreover, applying these steps separately would probably result in a significantly different delineation; the potential for a dramatic decrease in hydric soils areas as defined by NTCHS would be almost certain. These concerns are explained in detail below.

Hydric soil determinations using soil series: There are more than 15,000 recognized soil series within the current Soil Taxonomy. Each series has a specific range of physical and chemical characteristics. In most instances, the concepts of and specific criteria for individual series identification were established before the concept of a hydric soil and the NTCHS criterion were developed. Many soil series have characteristics that transgress the physical boundary between non-hydric and hydric soils. Soil conditions within wetland areas are often variable and typically do not fall solely within the range of characteristics for a particular soil series. Due to the vast number of soil series and the variability of soil conditions within the New England Region, only experienced soil scientists who have extensive soil mapping experience would be able to effectively delineate hydric soils using this method. In addition, to properly identify a soil to the series level generally requires that a test hole be dug to a depth of 40 inches which would require much added time and expense.

Hydric soil determination using soil taxonomy: Using the soil taxonomy criteria as stated in the proposed revisions (i.e., Histosol (except Folists), Sulfaquent, Hydraquent, or Histic Subgroup of Aquic Suborders) would only identify the very wettest of hydric soil conditions and would not delineate the full complement of hydric soils traditionally recognized under both the 1987 Corps and 1989 Federal Manuals. When using this proposed taxonomy criteria and comparing it to the current List of Hydric Soils for Massachusetts developed by the USDA-Soil Conservation Service, only 11 soil series in a list of 34 hydric soils qualify. If used separately, this method would clearly produce an erroneous determination and severely reduce the areas delineated as hydric soils.

Hydric soil determinations using Regional Indicators of Significant Soil Saturation: The proposed regional indicators are generally based on one soil characteristic to be observed at a shallow depth (6 to 12 inches). The team found that a positive observation may or may not meet the definition and criteria for hydric soils established by NTCHS. Regional indicators of soil saturation were originally developed as indicators of hydrology and were not intended to identify hydric soils. When used to identify hydric soils, these indicators typically distinguish a soil condition that is wetter (i.e., more conservative) than a hydric soil identified using the criteria developed by NTCHS. The proposed regional indicators, in some instances, are an over simplification of accepted soil science; if interpreted and applied by an inexperienced or unqualified individual, their use will likely produce erroneous determinations. The team recommends deleting Regional Indicators of Significant Soil Saturation from future editions of the Manual.

The revised Manual places strong emphasis on published soil survey reports. While they are an excellent general reference and should be reviewed prior to field work, at no time should a field investigation be circumvented because of information contained within a published soil survey report. Like any other mapping product, their accuracy and reliability are dependent upon the mapper and the resources (e.g., aerial photos) from which the map was derived. Hence, all soil surveys contain inaccuracies. In New England, every mapped soil unit has the potential for hydric soil inclusions and, depending upon the scale of mapping, these inclusions can be as large as 5 - 6 acres in size.

The portion of the draft Manual beginning with General Characteristics of Hydric Soils and ending with Atypical Hydric Soils represents a summary of subject matter contained within several comprehensive technical reference documents. Statements made within these sections are often over simplified and technically inaccurate, and could easily lead to misinterpretation resulting in inconsistent wetland delineations. These sections should be removed from Part II of the Manual. After substantial revision to make them technically accurate and less confusing, they may be appropriate in another section.

Under Part II of the Manual, Mandatory Technical Criteria For Vegetated Wetlands Identification, the hydric soil criterion should simply repeat, verbatim, the definition of and criteria for hydric soils as developed and revised by the NTCHS. Field verification methods to identify hydric soils should not be included under the section on Mandatory Technical Criteria. Rather, these methods should more properly be included under the section of the Manual which describes all field methods. Further, as explained above, the field verification methods in the revised Manual are confusing and technically inaccurate. They should be revised and clarified. See CONCLUSIONS AND RECOMMENDATIONS.

For the 1989 Federal and 1987 Corps Manuals, a regional method for field verification of soil drainage classes and an accompanying data sheet were developed by the Corps of Engineers-New England Division and the USDA-Soil Conservation Service. A variety of state and federal agency, university, professional organization and private sector personnel contributed to this effort. Under this method, hydric soil determinations are made using soil morphology or

combinations of soil morphologies observed within specified depths. Criteria and methods of documentation are consistent with Soil Taxonomy and the USDA-SCS Soil Survey Manual. Regional variations and atypical soil conditions are either captured by the methodology or are footnoted as exceptions. Soil characteristics to observe and document require holes dug to a depth of 30 inches. This method allows people with limited soils experience to make technically sound and consistent determinations, and alerts them to atypical or unusual soil conditions where a certified professional soil scientist may be needed. A copy of this New England metholodolgy is included as Appendix D.

FIELD TEST RESULTS

Tables 3 through 5 represent a summary of field test data, results, and the team's conclusions regarding each site's compliance with the three mandatory criteria under both the 1989 Federal Manual and 1991 proposed revisions. Locus maps and sketches for the 18 field sites visited are contained in Appendix B. Representative slides of the sites and accompanying narrative are contained in Appendix C; this narrative contains a brief discussion of the principal functions and values of the affected wetlands.

TABLE 3
FIELD TEST DATA - VEGETATION SUMMARY
FOR COMMUNITIES "Y" (1989) AND "Z" (1991)

Site	ST	NWI CLASS	Ratio of Wet/FAC/Upl	FAC Neut Test	1989 Dominance Meas: % OBL/FACW/FAC	91: PI x
TRI	CT	PFO1E	Y: 4/3/0 Z: 2/4/2	Y na	100% 75%	2.46 2.48
UM1	ME	PFO4E	Y: 3/5/2 Z: 4/5/1	Y Y	80% 90%	2.76 2.63
UM2	ME	PEM1E	NO		DATA	
McD	ME	PFO4E	Y: 2/3/4 Z: 4/3/1	N Y	55% 88%	2.77 2.83
LQR	MA	PFO4E	Y: 2/3/4 Z: 3/4/3	N na	35% 70%	3.11 3.07
WEB	MA	PFO/SS1E	Y: 0/4/1 Z: 0/1/0	N na	80% 100%	2.93 2.56
PLI	MA	PSS1E	Y: 2/0/1 Z: 2/0/1	Y Y	67% 67%	2.68 2.21
WIL	MA	PEM1E	Y: 1/1/0 Z: no data	Y na	100% no data	no data
RBB	MA	PFO1A	Y: 3/0/1 Z: 5/0/0	Y Y	75% 100%	2.08 1.93

TABLE 3 (con't)
FIELD TEST DATA - VEGETATION SUMMARY
FOR COMMUNITIES "Y" (1989) AND "Z" (1991)

Site	ST	NWI CLASS	Ratio of Wet/FAC/Dry	FAC Neut Test	1989 Dominance Meas: % OBL/FACW/FAC	91: PI x
EPP1	NH	PFO1/4E	Y: 1/4/3 Z: 3/2/2	N Y	63% 72%	3.01 2.99
EPP2	NH	PSS1E	Y: 2/3/3 Z: 2/1/2	N na	63% 60%	3.21 1.92
KEN	NH	PFO1E	Y: 3/5/2 Z: 3/2/2	Y Y	80% 72%	2.68 2.56
BRF	RI	PFO/SS1E	Y: 1/1/0 Z: 3/7/1	Y Y	100% 91%	2.64 2.61
SAK	RI	PFO/SS1E	Y: 2/3/0 Z: 0/5/1	Y N	100% 83%	2.57 2.71
BRR	RI	PFO/SS1E	Y: 2/3/2 Z: 5/2/0	na Y	71% 100%	2.74 2.57
RUT	VT	PEM1E	Y: 5/0/1 Z: 3/1/1	Y Y	83% 80%	3.33 2.93
ADD	VT	PEM1B	Y: 1/2/5 Z: 1/2/1	N na	38% 75%	3.88 2.41
CAB	VT	PFO4E	Y: 3/3/1 Z: 3/2/0	Y Y	86% 100%	2.77 2.69

TABLE 4
FIELD TEST DATA - SOILS SUMMARY
FOR COMMUNITIES "Y" (1989) AND "Z" (1991)

Site	ST	Published Soil Survey Series	Soil Series Identified in Field	Drainage Class	Soil Taxonomy	National List	Regional Indicators Saturation	Hydric Soil
TRI Y	CT	Wilbraham	Wilbraham	PD	Aquic Dystrochrept*	yes	3	yes
Z		Wilbraham	Wilbraham	PD	Aquic Dystrochrept	yes	3	yes
UM1 Y	ME	Biddeford	Scantic	PD	Typic Haplaquept	yes	5a	yes
Z		Biddeford	Scantic	PD	Typic Haplaquept	yes	3, 5a	yes
UM2 Y	ME	Scantic	Scantic	PD	Typic Haplaquept	yes	3, 5a	no-altered hydro
Z		Scantic	Scantic	PD	Typic Haplaquept	yes	3, 5a	yes
McD Y	ME	unavailable	Brayton	PD	Aeric Haplaquept	yes	5a	yes
Z		unavailable	Burnham (inclsn)	VPD	Typic Haplaquept	yes	5a	yes
LQR Y	MA	Ridgebury	Ridgebury	PD	Aeric Haplaquept	yes	none	yes
Z		Ridgebury	Ridgebury	PD	Typic Haplaquept	yes	5a	yes
WEB Y	MA	Chatfield -	Ridgebury	PD	Aeric Haplaquept	yes	5c, 6	yes
Z		Hollis Complex	Swansea	VPD	Terric Medisaprist	yes	1	yes
PLI Y	MA	Udipsamments	no est. series	PD	Sulfaquent	no	A2	yes
Z		Udipsamments	Matunuck	VPD	Histic Sulfaquent	yes	1, 2	yes
WIL X	MA	Deerfield	Wareham	PD	Humaqueptic Psammaquent	yes	none	yes
Z		Scarboro	Swansea	VPD	Terric Medesaprist	yes	1	yes
RBB Y	MA	Limerick	Limerick	PD	Typic Fluvaquent	yes	none	yes
Z		Limerick	Saco	VPD	Fluvaquentic Humaquept	yes	4	yes

* atypical soil - - red parent material

TABLE 4 (con't)
FIELD TEST DATA - SOILS SUMMARY
FOR COMMUNITIES "Y" (1989) AND "Z" (1991)

Site	ST	Published Soil Survey Series	Soil Series Identified in Field	Drainage Class	Soil Taxonomy	National List	Regional Indicators Saturation	Hydric Soil
EP1 Y	NH	Pipestone	Swampscott	PD	Entic Haplaquod	no	A1	yes
Z		Pipestone	Maybid (taxadj)	VPD	Histic Haplaquod	yes	A2	yes
EP2 Y	NH	Pipestone	Swanton	PD	Aeric Haplaquept	yes	none	yes
Z		Ossipee	Maybid	VPD	Typic Humaquept	yes	2, 5a	yes
KEN Y	NH	Ridgebury	Ridgeby (taxad)	SPD	Aquic Dystrochrept	yes	5b	yes
Z		Ridgebury	Ridgebury	PD	Aeric Haplaquept	yes	4, 5a	yes
BRF Y	RI	Ridgebury	Ridgebury	PD	Aeric Haplaquept	yes	none	yes
Z		Ridgebury	Ridgebury	PD	Aeric Haplaquept	yes	5a	yes
SAK Y	RI	Stissing	Stissing	SPD	Aeric Haplaquept	yes	5a	yes
Z		Mansfield	Stissg (taxadj)	PD	Typic Haplaquept	yes	5a	yes
BRR Y	RI	Adrian	Walpole variant	PD	Typic Haplaquept	yes	6	yes
Z		Adrian	Scarboro	VPD	Histic Humaquept	yes	1, 4	yes
RUT Y	VT	Canandaigua	Raynham	PD	Aeric Haplaquept	yes	5b	yes
Z		Canandaigua	Raynham	PD	Aeric Haplaquept	yes	3, 5a	yes
ADD X	VT	Vergennes	Kingsbury	SPD	Aeric Ochraqualfs	no	none	yes
Y		Vergennes	Panton	PD	Typic Ochraqualfs	yes	5a	yes
CAB Y	VT	Cabot	Cabot	PD	Typic Haplaquept	yes	none	yes
Z		Cabot	Peacham	VPD	Typic Humaquept	yes	none	yes

TABLE 5
FIELD TEST DATA - HYDROLOGY SUMMARY
FOR COMMUNITIES "Y" (1989) AND "Z" (1991)

Site	ST	Date Visited	Approx Depth to Seasonal High Water Table [1,2]	Aerial Photos Avail.	Hydro Data Avail.	Direct Evidence[3] Free Water	Squeeze Test	Shake Test	Field Indicators of Hydrology[5]	Criterion Met 1989	Criterion Met 1991
TRI Y	CT	09/19/91	0 - 7"	no	no	>24"	no	no	1, 7	yes	no[4]
Z			0 - 4"	no	no	>24"	no	no	1,7,8,10,12	yes	yes
UMO1 Y	ME	09/08/91	0 - 5"	no	no	>24"	no	no	4,5,7,8,10,11	yes	no[4]
Z			surface	no	no	19"	19"	19"	1,4,7-10,12	yes	yes
UMO2 Y	ME	09/09/91	altered hydro	no	no	>24"	no	no	1	no	no
Z			ponding	no	no	>24"	no	no	1	yes	yes
McD Y	ME	09/10/91	0 - 1.5"	no	no	>24"	surface	surface	7, 8	yes	no[4]
Z			surface	no	no	4"	surface	surface	7, 8, 10	yes	yes
LQR Y	MA	08/22/91	0 - 5"	no	limited	>24"	no	no	5, 7	yes	no
Z			0 - 4"	no	limited	28"	12"	18"	5, 7, 8, 10	yes	yes
WEB Y	MA	08/26/91	0 - 2"	no	no	16"	surface	surface	none	yes	no
Z			ponding	no	no	4"	surface	surface	8, 11	yes	yes
PLI Y	MA	09/11/91	surface	no	no	17"	14"	9"	7 - 9	yes	yes
Z			ponding	no	no	8"	surface	surface	2, 4, 8, 9	yes	yes
WIL Y	MA	10/01/91	no hydro data	no	no	no hydrologic			data	recorded	
Z			ponding	no	no	+2"	surface	surface	1, 3, 7, 8,	yes	yes
RBB Y	MA	09/30/91	surface	no	limited	>24"	no	no	3, 5, 8, 10,	yes	no
Z			flooding	no	limited	22"	14"	14"	1,3,5,8-10,11	yes	yes

TABLE 5 (con't)
FIELD TEST DATA - HYDROLOGY SUMMARY
FOR COMMUNITIES "Y" (1989) AND "Z" (1991)

Site	ST	Date Visited	Approx Depth to Seasonal High Water Table	Aerial Photos Avail.	Hydro Data Avail.	Direct Evidence Free Water	Direct Evidence Squeeze Test	Direct Evidence Shake Test	Field Indicators of Hydrology	Criterion Met 1989	Criterion Met 1991
EPP1 Y	NH	08/27/91	surface	no	no	11"	surface	surface	7	yes	no[4]
Z			ponding	no	no	4"	surface	surface	7, 8, 10	yes	yes
EPP2 Y	NH	08/28/91	0 - 6"	no	no	22"	4"	17"	1, 7	yes	no[4]
Z			flooding	no	no	5"	surface	surface	7	yes	yes
KEN Y	NH	08/29/91	0 - 5"	no	no	23"	2"	13"	none	yes	no
Z			0 - 4"	no	limited	10"	surface	surface	1,4,5,8,10	yes	yes
BRF Y	RI	09/12/91	0 - 8"	no	no	>16"	no	no	none	yes	no
Z			0 - 2"	no	no	>14"	no	no	6 - 8	yes	yes
SAK Y	RI	09/13/91	0 - 3"	no	no	>13"	no	no	7	yes	no[4]
Z			0 - 1.5"	no	no	>12"	no	no	7, 8	yes	yes
BRR Y	RI	09/18/91	0 - 6"	no	no	31"	no	no	5, 7, 8, 10	yes	no[4]
Z			surface	no	no	15"	2"	2"	1,5,7-10,11	yes	yes
RUT Y	VT	09/03/91	0 - 8"	no	no	>40"	no	no	none	yes	no
Z			0 - 7"	no	no	>40"	no	no	1, 7, 10	yes	yes
ADD Y	VT	09/04/91	0 - 2"	no	no	>36"	no	no	none	no	no
Z			surface	no	no	20"	20"	20"	4, 5, 8, 10	yes	yes
CAB Y	VT	09/05/91	0 - 4"	no	no	30"	18"	22"	4,5,7,8,10	yes	no[4]
Z			surface	no	no	20"	10"	17"	4 - 8, 10	yes	yes

Footnotes:
1. Measurements were made from the soil surface and interpreted from soil morphology.
2. Due to a dark colored (organic rich) surface layer, only depth ranges could be interpreted from soil wetness morphology.
3. Measurements were made from the ground surface.
4. Soil scientists familiar with local soil conditions did not believe that this soil would be saturated at the surface for 21 or more consecutive days during the growing season.
5. Refer to Key to Field Indicators of Wetland Hydrology on next page

Key to Field Indicators of Wetland Hydrology

Provided in the Proposed Revisions

1. oxidized rhizospheres

2. sulfidic material within 12"

3. silt marks

4. drift lines

5. surface scouring

6. plant morphological adaptations

7. shallow rooting

8. blackened leaves

9. water-stained trunks

10. wetland drainage patterns

11. water borne sediment deposits

CONCLUSIONS AND RECOMMENDATIONS Based on its analyis of the proposed revisions and the field testing conducted, the New England Federal Interagency Review Team reached the following conclusions and recommendations.

Hydrology Criterion

Conclusions: The proposed revisions to this criterion are not scientific. The revised criterion is more restrictive than currently accepted science regarding the duration, frequency and seasonality of inundation or saturation necessary to develop hydric soils and hydrophytic plants. As revised, this criterion will eliminate or substantially reduce areas traditionally recognized as wetlands in New England. Wetland hydrology should be documented within the upper part of the soil profile where the majority of plant roots occur, not restricted "to the surface" as required in the 1991 proposed revisions. Documenting a water table within 12 and 6 inches of the surface in non-sandy and sandy soils, respectively, accurately accounts for an effective saturation zone in the upper part due to capillary rise. Also, the concepts of growing season contained in both the 1989 manual and 1991 proposed revisions are inappropriate. Biological activity occurs within the root zone of hydric soils through extended periods of the year. The conventional growing season for agricultural and upland vegetation does not accurately reflect conditions in wetlands.

The proposed field indicators of hydrology are not evidence of a specific duration of inundation or saturation and may only reflect a single event that could have occurred at any time during the year. Hydric soil morphology and the presence of a hydrophytic plant community relate most directly to a duration and history of inundation or saturation, and are proven indicators of saturation in the upper part of the soil for a sufficient duration to create a wetland system. Additional field indicators, such as blackened leaves, pit and mound topography, and shallow rooting, clearly deserve recognition as indicators of wetland hydrology in New England.

Recommendations:

The criterion should be revised to read:

An area has wetland hydrology when it is either

1. inundated or saturated, usually for two or more consecutive weeks, throughout the upper part of the soil when unfrozen. Inundated or saturated in the upper part of the soil means a water table:

   a. within 12 inches of the surface with a capillary fringe that extends to the soil surface in non-sandy soils, or

   b. within 6 inches of the surface with a capillary fringe that extends to the soil surface in sandy soils; or,

2. periodically flooded by tidal water in most years.

The soil surface should be defined as follows:

For organic soils (Histosols) or mineral soils with a thick organic surface layer (histic epipedon), the soil surface is the uppermost organic horizon or layer that is, or has been, saturated for prolonged periods. Otherwise, the soil surface is the top of the mineral soil.

In addition, the team recommends that in New England, observing one or more of the following field indicators consititutes a positive determination of wetland hydrology (in the absence of significant drainage or modification to the hydrologic regime of the site):

o Hydric soil morphologies associated with prolonged wetness.

o Blackened leaves occurring in flat areas or depressions. This is a particularly reliable indicator of saturation or inundation for long duration (i.e., greater than 14 consecutive days). Blackened leaves develop only under prolonged periods of wetness and anaerobiosis. Field testing indicates that Munsell Chart colors with chroma two or less are a reliable indicator.

o Water marks on stems or trunks or other fixed objects.

o The consistent and conspicuous absence of moss on the lower portions of trunks or stems, rocks, or other fixed, upright objects when the moss is readily apparent on the upper portions.

o Distinct or prominent oxidized rhizospheres surrounding 5% of the observed roots in the upper part of the soil profile.

o Pit and mound topography. In New England, this feature reliably indicates long term wetland hydrology since it develops from windthrows, resultant blocking/damming effects, and the creation of wetland drainage patterns. However, the proper ratio should be determined jointly by the agencies on a regional basis, and not decided by individual agencies as the 1991 draft implies, which would likely result in different standards. In New England, the standard for the ratio of pits to mounds is "greater than 50%."

o Sulfidic material within 20 inches of the soil surface rather than 12 inches. Twenty inches is consistent with the requirements of Soil Taxonomy and is a feature of extreme wetness.

o Plant morphological adaptations as described in the manual. The team recommends including shallow rooting as a reliable indicator in New England. Shallow roots should be defined by: a) abundance -- few or less; b) size -- fine, medium or coarse; and c) depth -- not extending to depths greater than 6 inches below the soil surface.

o Wrack lines in tidally influenced wetlands.

o Direct observation of surface inundation or soil sauration in the upper part of the profile. While direct observation is a positive indication, its absence does not mean that wetland hydrology is lacking.

o Silt marks, drift lines, debris, and surface scouring when both hydric soils and a hydrophytic plant community are confirmed.

Some field indicators (e.g. blackened leaves) were exluded; yet, they can be very reliable under many circumstances in New England.

Some field indicators that were retained in the manual may be misleading, e.g. this red silt may be relic from the 1986 Flood.

Vegetation Criterion

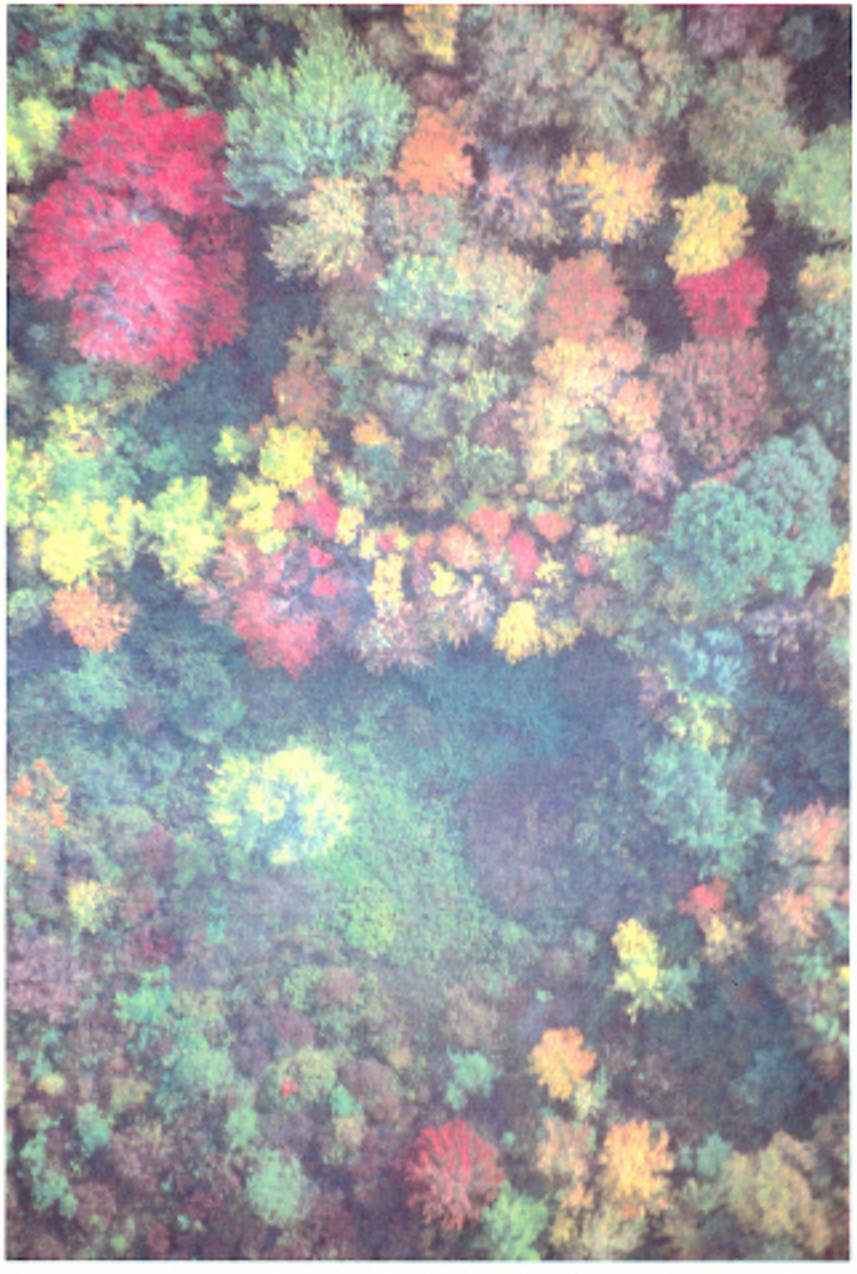
Conclusions: The point-intercept method and prevalence index threshold are not appropriate for defining the boundaries of wetlands. It is not technically defensible to exclude all facultative and facultative upland plant species from consideration when determining the presence of a hydrophytic plant community. The changed criterion excludes many typical plant communities traditionally recognized as wetlands in New England. As proposed, the results of field methods (excluding point-intercept) for determining the presence of a hydrophytic plant community cannot be correlated with the stated vegetation criterion (i.e., prevalence index <3.0). As the criterion is stated strictly as a prevalence index threshold, it is impossible to relate any other dominance measure results (e.g., that $>50\%$ of dominants are obligate, facultative wet, or facultative) from field methods other than point-intercept to the criterion. Therefore, though the manual provides several methods for determining the presence of a hydrophytic plant community, point-intercept is the only method which yields a result that allows that determination to be made.

As proposed, facultative and facultative upland plant species are no longer considered hydrophytes under any conditions. This reveals a serious misunderstanding of the ecology and physiology of these plants. Facultative and, to a lesser degree, facultative upland dominated plant communities represent a large portion of wetland systems throughout New England. Because of their ability to tolerate wet conditions, these species do in fact correlate well with wetland determinations where hydric soils and wetland hydrology are confirmed. Red maple, eastern white pine, eastern hemlock, and balsam fir-red spruce swamps typify these common systems. The proposed revisions make the norm in New England an exception or special circumstance. As a result, the proposed criterion eliminates or substantially reduces in size many of these traditionally recognized wetlands.

Recommendations:

The vegetation criterion should be expressed solely as a dominance measure, and read as follows:

> An area has hydrophytic vegetation when, under normal circumstances, more than 50% of the composition of the dominant species from all strata are obligate wetland, facultative wetland, and/or facultative species. CAUTION: When a plant community has less than or equal to 50% of the dominant species from all strata represented by obligate wetland, facultative wetland, and/or facultative species, and hydric soils and wetland hydrology are present, the area also has hydrophytic vegetation. (NOTE: These areas are considered problem area wetlands.)



High structural diversity is typical in areas that will be lost.

Procedures will be arduous and may lead to very inappropriate conclusions.

Hydric Soils Criterion

Conclusions: The proposed hydric soil criterion, the steps for field verification, and the accompanying background discussion on hydric soil characteristics are often inconsistent, technically incomplete, and overly simplified. As stated, they are difficult to interpret and apply in the field and may lead to inconsistent and inaccurate hydric soil determinations.

Several of the criteria (items 1, 2, and 3) listed within the Hydric Soil Criterion section of the proposed revisions are repetitive and, in some instances, represent an incomplete subset of the nationally accepted criteria for hydric soils (item 4) developed by the National Technical Committee on Hydric Soils (NTCHS).

The three steps for field verification of hydric soils require an extensive technical soils background, substantial field experience, and a significant amount of time. Applying these steps separately would probably result in a significantly different delineation; the potential for a dramatic decrease in hydric soils areas as defined by NTCHS would be almost certain.

The revised Manual places strong emphasis on published soil survey reports. All soil surveys contain inaccuracies. In New England, every mapped soil unit has the potential for hydric soil inclusions and, depending upon the scale of mapping, these inclusions can be as large as 5 - 6 acres in size.

The sections of the draft Manual beginning with General Characteristics of Hydric Soils and ending with Atypical Hydric Soils are often over simplified and technically inaccurate, and could easily lead to misinterpretation resulting in inconsistent wetland delineations. This information belongs in sections (e.g., background, methods, reference) separate from the mandatory criteria.

Recommendations:

Hydric soil criterion: This should simply repeat, verbatim, the definition of a hydric soil and the criteria for hydric soils as developed and revised by the NTCHS.

Field verification methods to identify hydric soils: These should not be included under the section on Mandatory Technical Criteria; they are best described in the field methods section. Moreover, these methods should be developed and refined by recognized experts in each geographic region of the country. Hydric soil determinations should be made using soil morphology or combinations of soil morphologies observed within specific depths. Methods and standards for documentation should be consistent with Soil Taxonomy and the USDA Soil Survey Manual.

Problem and Exception Area Appendices

Conclusions: It is unclear when, how, and under what circumstances to employ these provisions of the proposed manual. When taken with the changes to the three criteria and their respective field indicators, the result is a determination of non-wetland for any community that fails the changed criteria. These appendices are disjointed, lack adequate explanation and description, and are unrelated to the criteria, field indicators, and methods prerequisite for their application. In many circumstances, the wetland types listed or described as exceptions constitute the majority of wetland systems in New England.

Recommendations:

Problem and exception areas: A clear, concise, and consolidated link must be provided for applying these appendices in field situations. Also, exceptions must be strictly limited to those wetlands which meet that term and cannot include common, wide-spread regional systems which should be routinely captured by the mandatory criteria and their respective field indicators.

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APPENDIX A: Non-Team Participants

The following individuals provided field support or technical input:

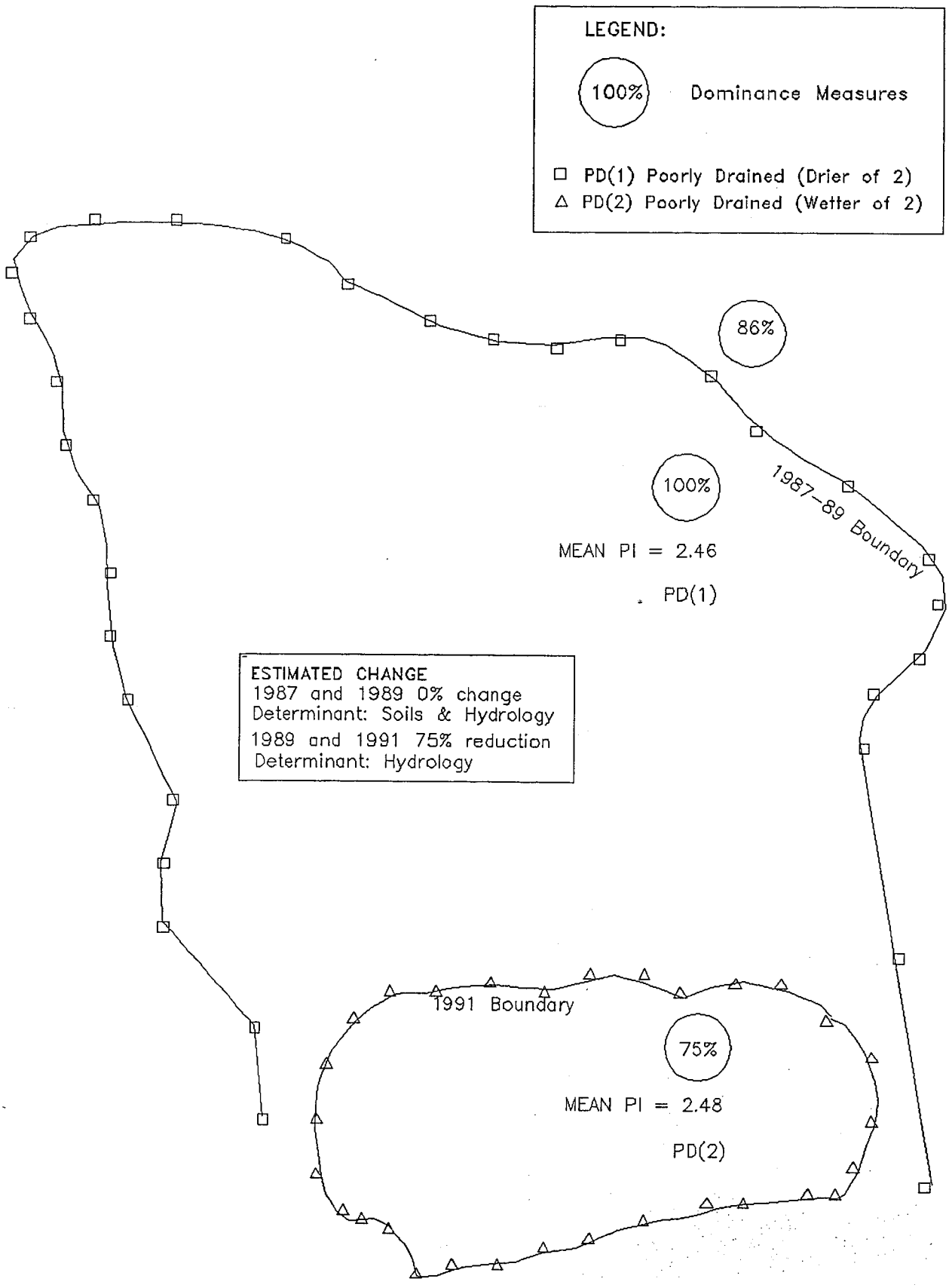
Maine:	U.S. Soil Conservation Service: David Poe Ken LaFlamme Bob Wengryznek Ron Olson Maine Soil and Water Conservation Commission: Dave Rocque
New Hampshire:	U.S. Soil Conservation Service: Carter Christenson Alan Ammann Russ Kelsea George Stevens NH Wetlands Bureau: Ken Kettenring Lori Sommer U.S. Fish & Wildlife Service: Vernon Lang Bill Neidermyer Philip Morrison
Massachusetts:	U.S. Soil Conservation Service: Dick Scanu Bill Taylor Dan Lenthal Dennis Verdi U.S. Fish & Wildlife Service: Sherry Morgan U.S. Environmental Protection Agency: Doug Thompson Ann Williams-Dawe Virginia Laszewski Kyla Bennett Ed Reiner

	University of Massachusetts: Peter Veneman Judy Bartos
Rhode Island:	U.S. Soil Conservation Service: Everett Stuart Elmer Dengler James Turenne
	Dept. of Environmental Management: Brian Tefft Marty Wencek
	University of Rhode Island: Brian Lesinski George Loomis
	U.S. Fish & Wildlife Service: Ralph Abele
	U.S. Environmental Protection Agency: Mark Kern
Connecticut:	U.S. Soil Conservation Service: Kip Kolesinskas
Vermont:	U.S. Soil Conservation Service: Kip Potter Dave Van Houten
	U.S. Environmental Protection Agency: Greg Hellyer

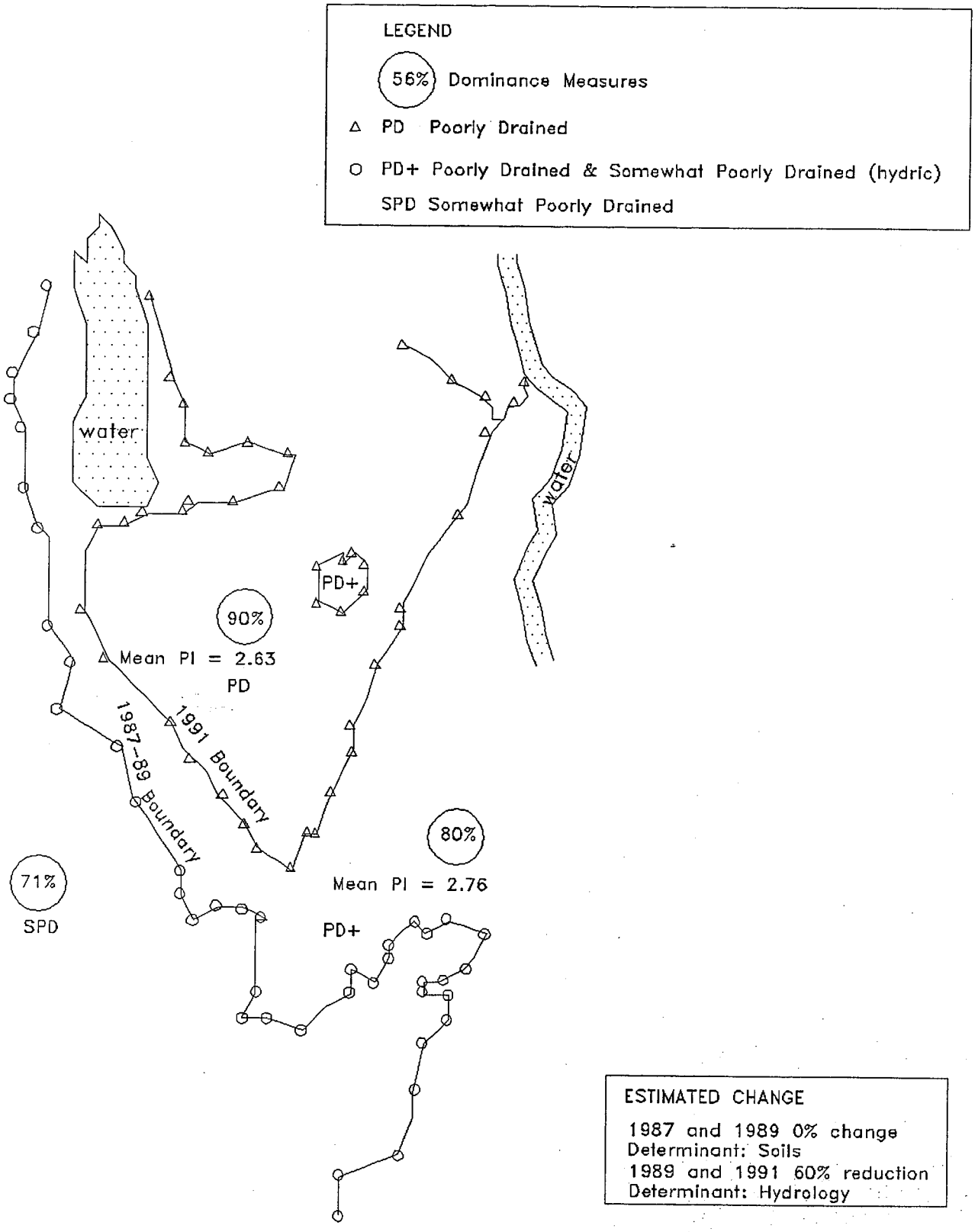
APPENDIX B: Field Test Site Sketches

The following sketches show the plant/soil communities and wetland boundaries at the 18 sites visited for field testing.

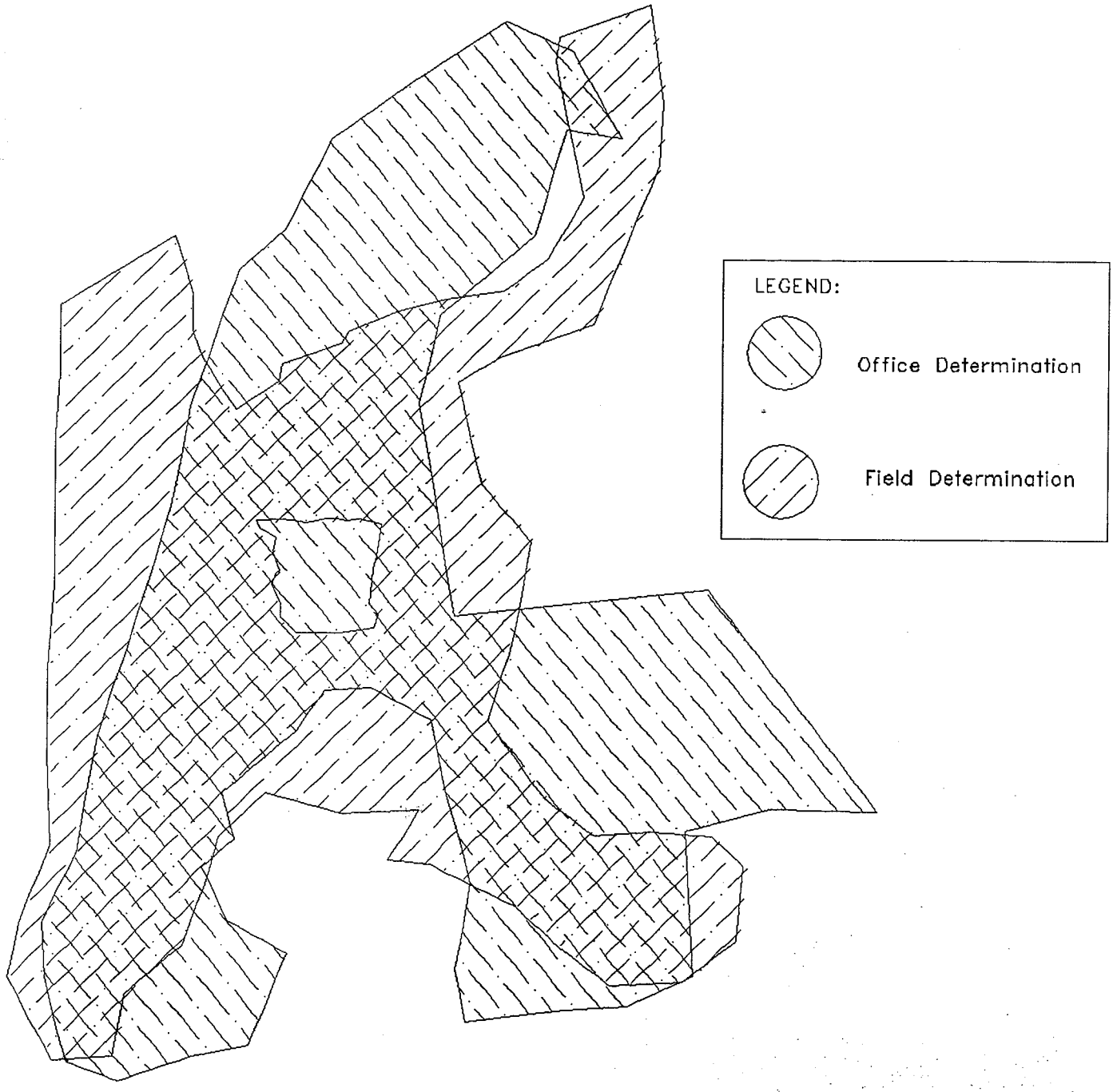
TRI


LEGEND:
100% Dominance Measures
PD(1) Poorly Drained (Drier of 2)
PD(2) Poorly Drained (Wetter of 2)
86%
100%
1987-89 Boundary
MEAN PI = 2.46
PD(1)
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Soils & Hydrology
1989 and 1991 75% reduction
Determinant: Hydrology
1991 Boundary
75%
MEAN PI = 2.48
PD(2)

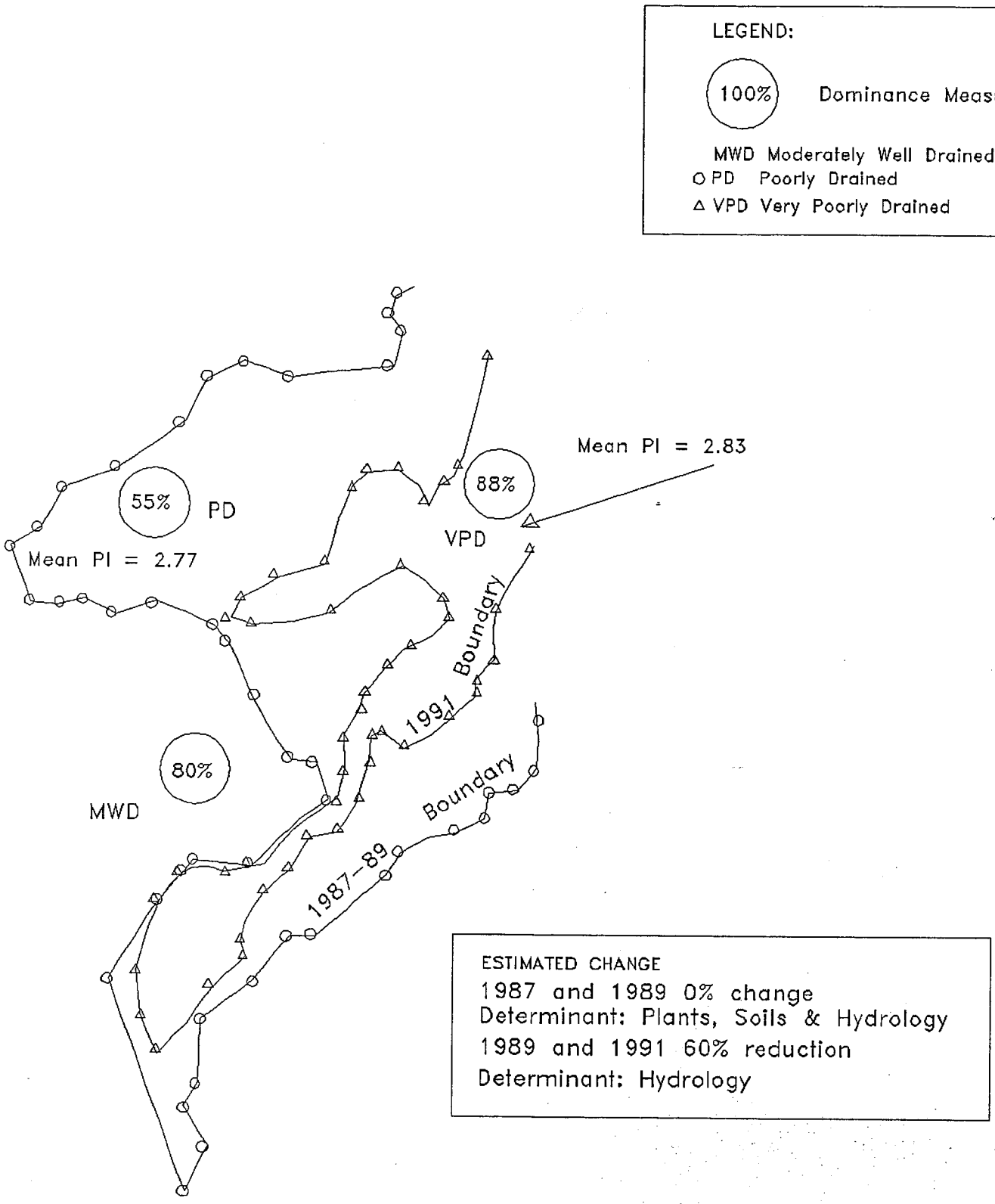
UM01


LEGEND
56% Dominance Measures
PD Poorly Drained
PD+ Poorly Drained & Somewhat Poorly Drained (hydric)
SPD Somewhat Poorly Drained
water
water
PD+
90%
Mean PI = 2.63
PD
1991 Boundary
1987-89 Boundary
80%
Mean PI = 2.76
PD+
71%
SPD
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Soils
1989 and 1991 60% reduction
Determinant: Hydrology

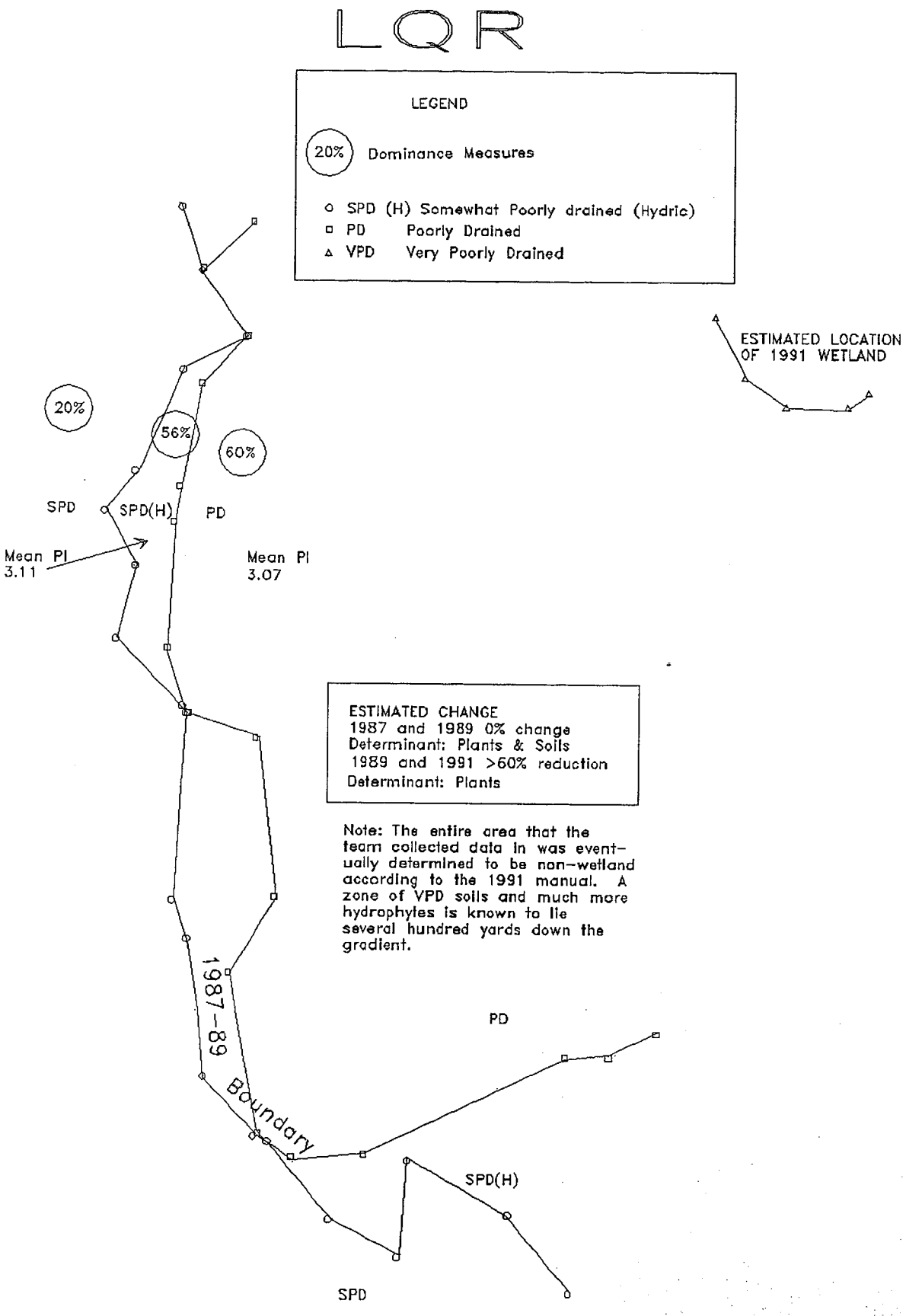
UM02



MC D


LEGEND:
100%
Dominance Measures
MWD Moderately Well Drained
PD Poorly Drained
VPD Very Poorly Drained
55%
PD
Mean PI = 2.77
88%
VPD
Mean PI = 2.83
80%
MWD
1991 Boundary
1987-89 Boundary
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants, Soils & Hydrology
1989 and 1991 60% reduction
Determinant: Hydrology

LQR

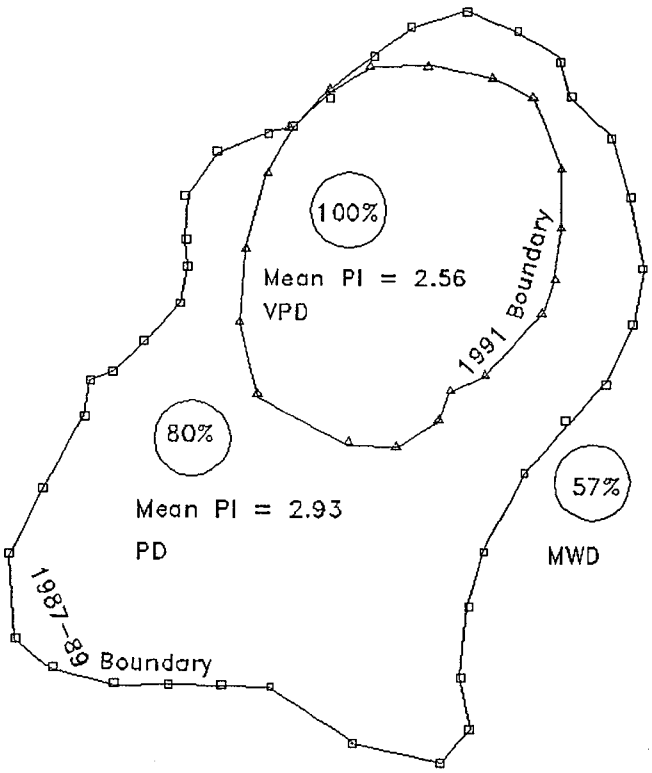

LEGEND
20% Dominance Measures
SPD (H) Somewhat Poorly drained (Hydric)
PD Poorly Drained
VPD Very Poorly Drained
ESTIMATED LOCATION OF 1991 WETLAND
20%
56%
60%
SPD
SPD(H)
PD
Mean PI 3.11
Mean PI 3.07
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants & Soils
1989 and 1991 >60% reduction
Determinant: Plants
Note: The entire area that the team collected data in was eventually determined to be non-wetland according to the 1991 manual. A zone of VPD soils and much more hydrophytes is known to lie several hundred yards down the gradient.
1987-89 Boundary
PD
SPD(H)
SPD

WEB

LEGEND

20% Dominance Measures

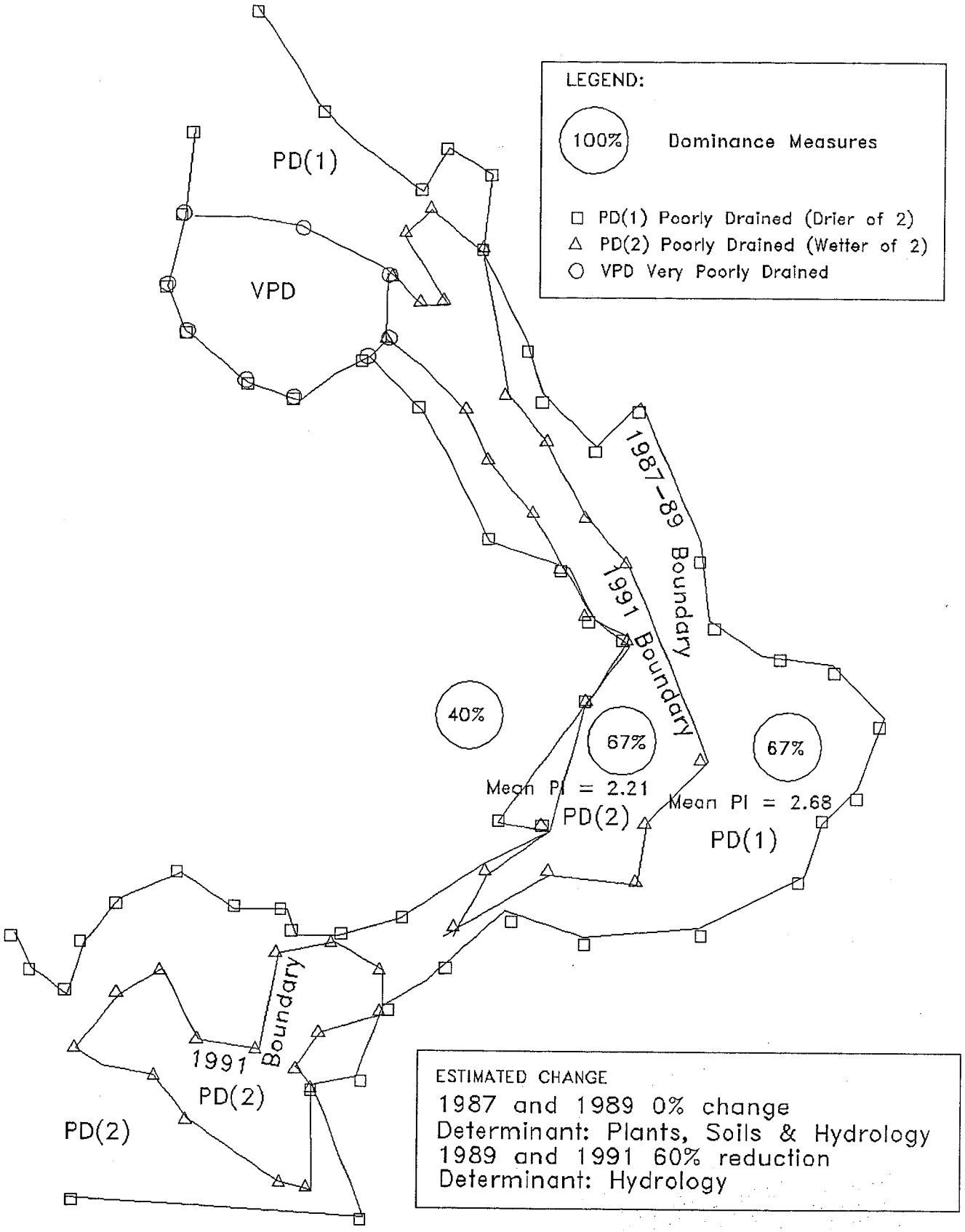
□ PD Poorly Drained
△ VPD Very Poorly Drained



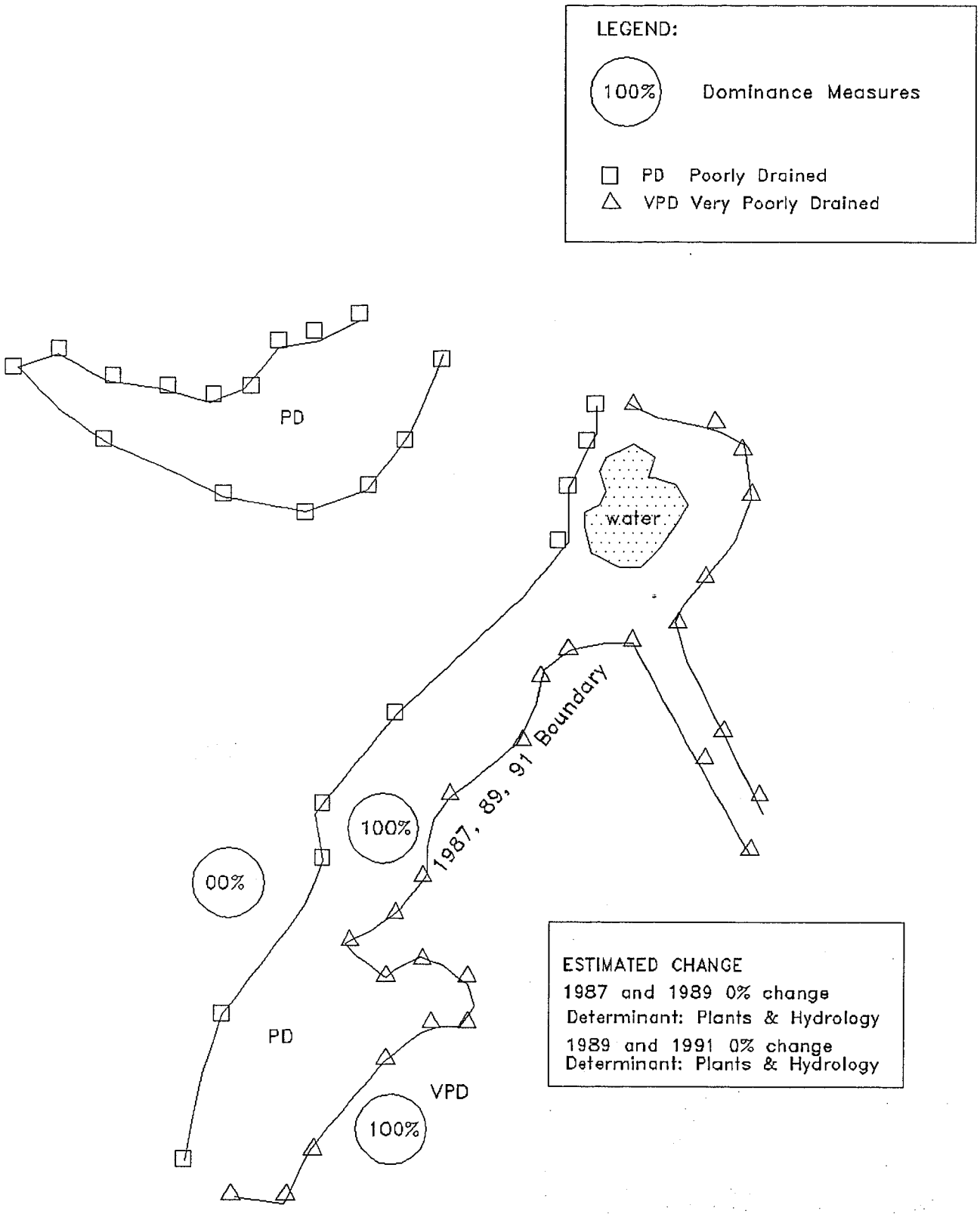
ESTIMATED CHANGE

1987 and 1989 0% change
Determinant: Soils
1989 and 1991 65% reduction
Determinant: Hydrology

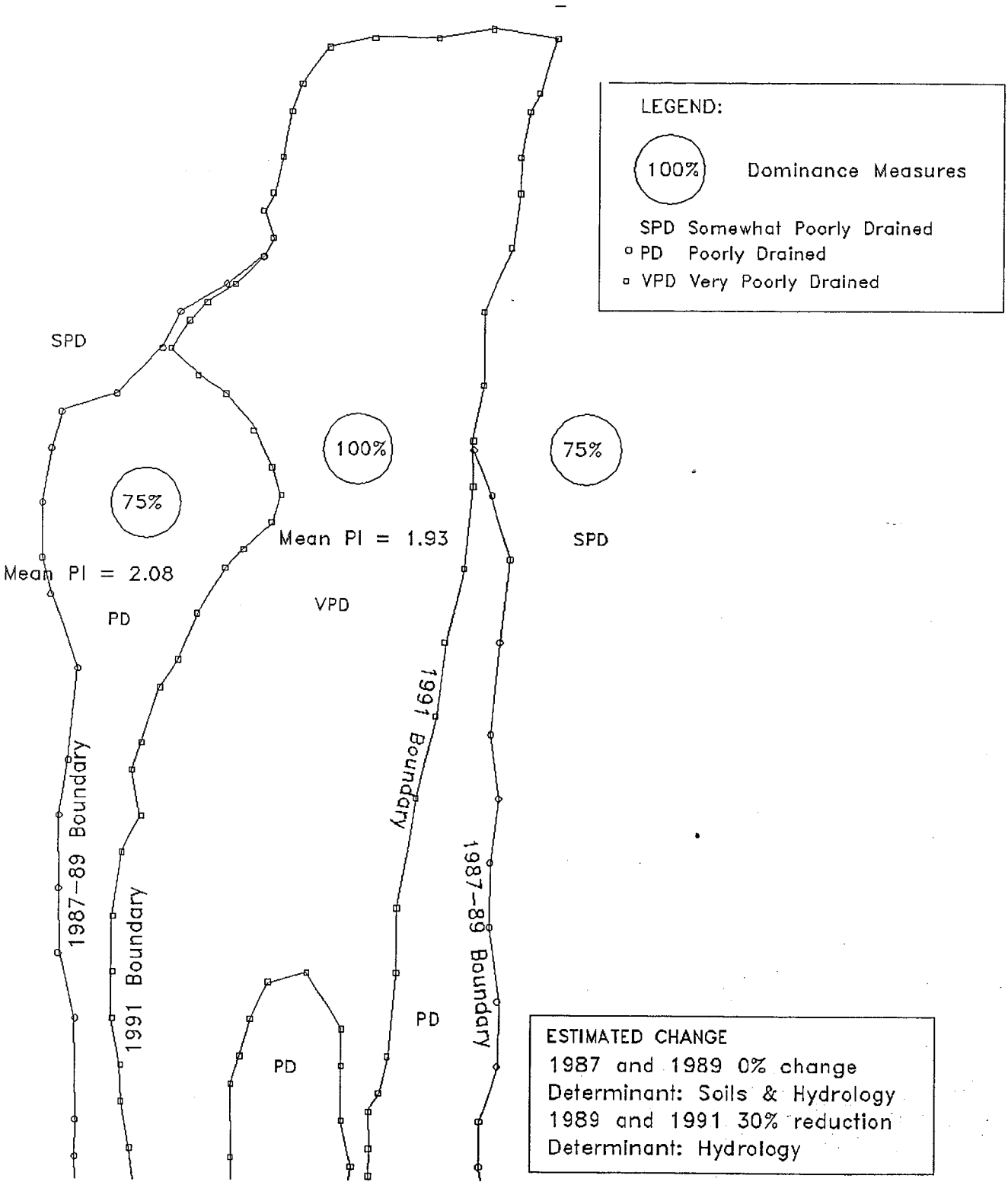
PLI


LEGEND:
100%
Dominance Measures
PD(1) Poorly Drained (Drier of 2)
PD(2) Poorly Drained (Wetter of 2)
VPD Very Poorly Drained
PD(1)
VPD
1987-89 Boundary
1991 Boundary
40%
67%
67%
Mean PI = 2.21
PD(2)
Mean PI = 2.68
PD(1)
1991 Boundary
PD(2)
PD(2)
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants, Soils & Hydrology
1989 and 1991 60% reduction
Determinant: Hydrology

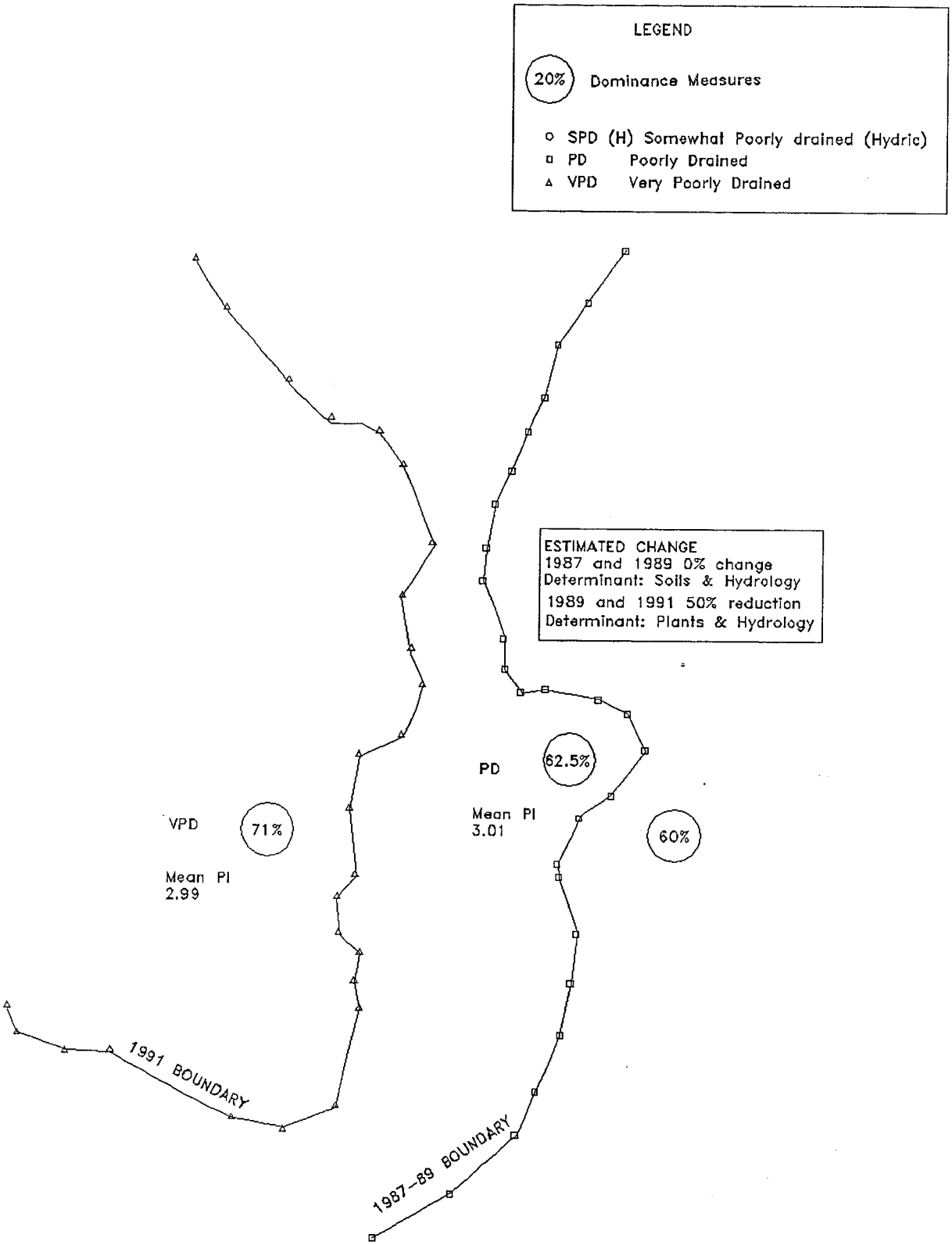
WIL


LEGEND:
100%
Dominance Measures
PD Poorly Drained
VPD Very Poorly Drained
PD
water
1987, 89, 91 Boundary
100%
00%
PD
VPD
100%
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants & Hydrology
1989 and 1991 0% change
Determinant: Plants & Hydrology

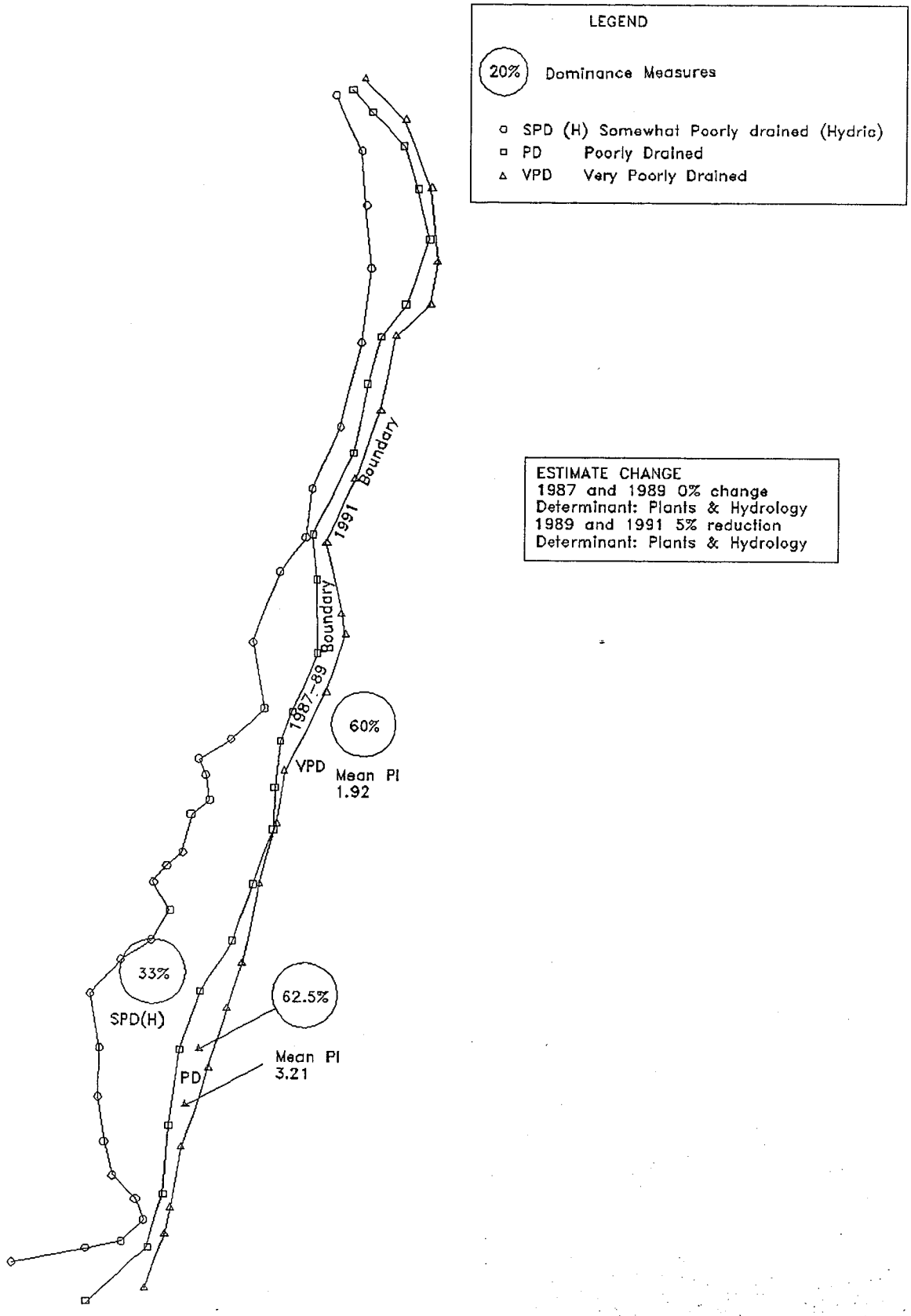
RBB


LEGEND:
100% Dominance Measures
SPD Somewhat Poorly Drained
PD Poorly Drained
VPD Very Poorly Drained
SPD
100%
75%
75%
Mean PI = 1.93
SPD
Mean PI = 2.08
PD
VPD
1991 Boundary
1987-89 Boundary
1987-89 Boundary
1991 Boundary
PD
PD
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Soils & Hydrology
1989 and 1991 30% reduction
Determinant: Hydrology

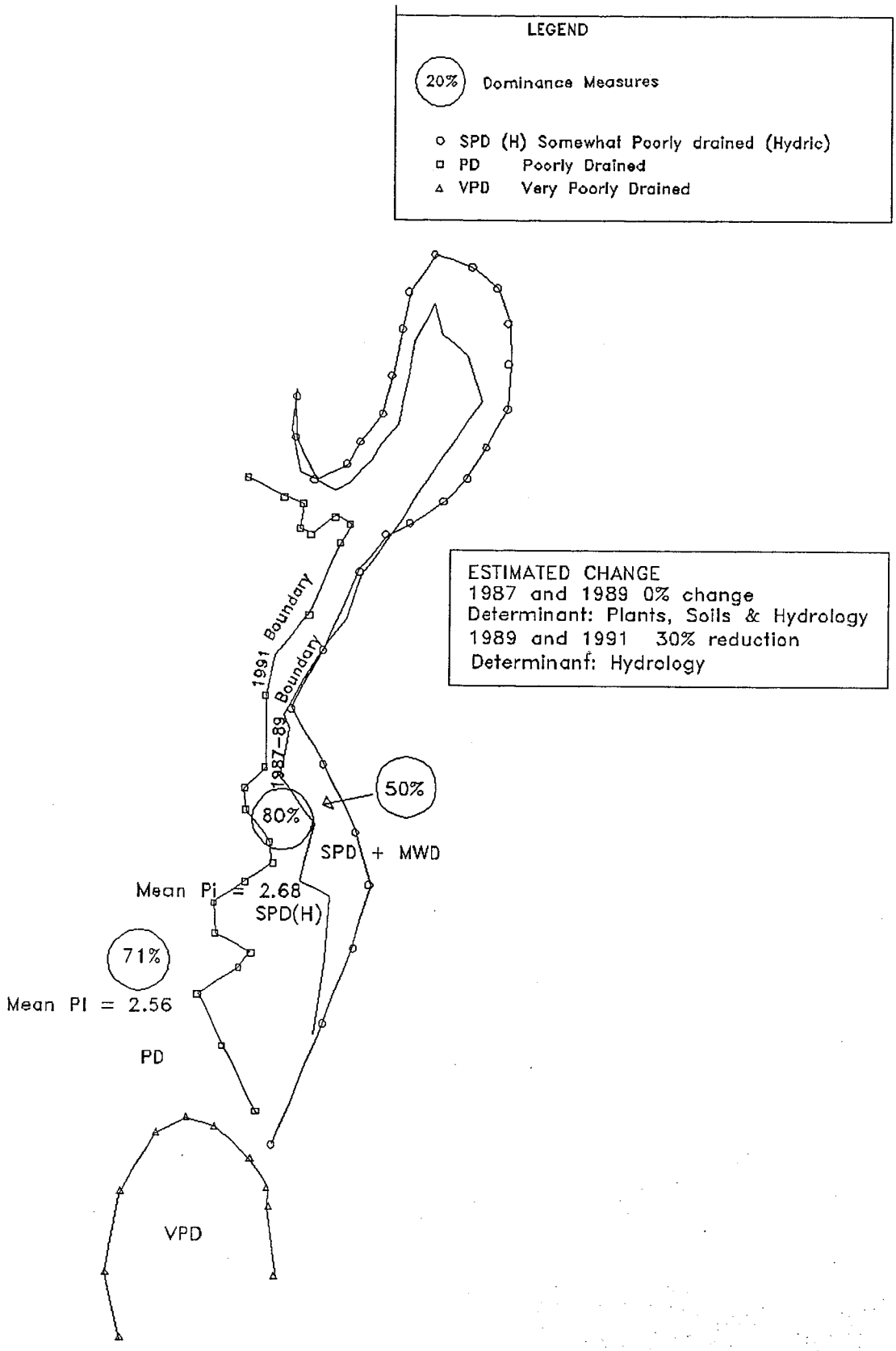
EPP 1


LEGEND
20% Dominance Measures
SPD (H) Somewhat Poorly drained (Hydric)
PD Poorly Drained
VPD Very Poorly Drained
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Soils & Hydrology
1989 and 1991 50% reduction
Determinant: Plants & Hydrology
PD
62.5%
Mean PI
3.01
60%
VPD
71%
Mean PI
2.99
1991 BOUNDARY
1987-89 BOUNDARY

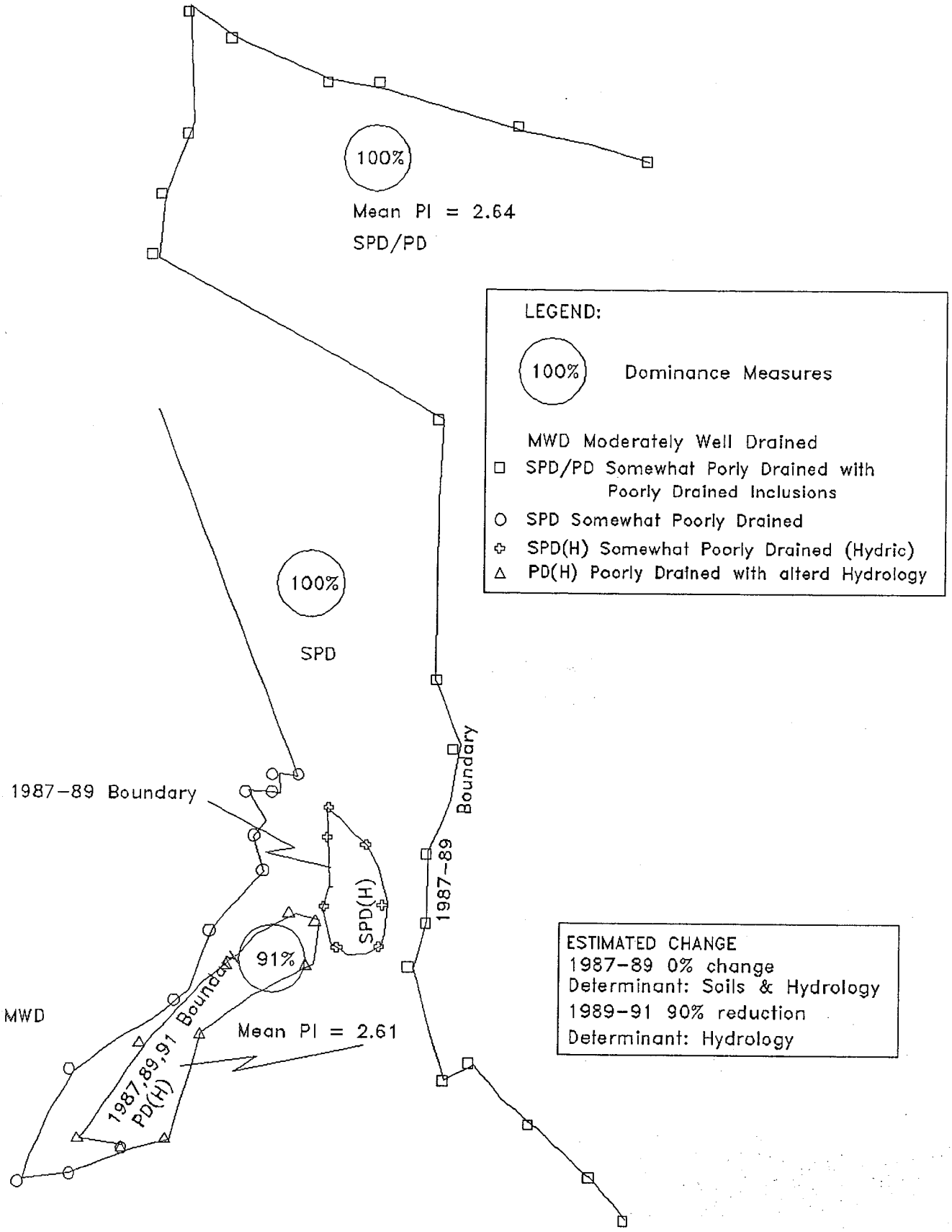
EPP2


LEGEND
20% Dominance Measures
SPD (H) Somewhat Poorly drained (Hydric)
PD Poorly Drained
VPD Very Poorly Drained
ESTIMATE CHANGE
1987 and 1989 0% change
Determinant: Plants & Hydrology
1989 and 1991 5% reduction
Determinant: Plants & Hydrology
1991 Boundary
1987-89 Boundary
60%
VPD
Mean PI
1.92
33%
SPD(H)
62.5%
PD
Mean PI
3.21

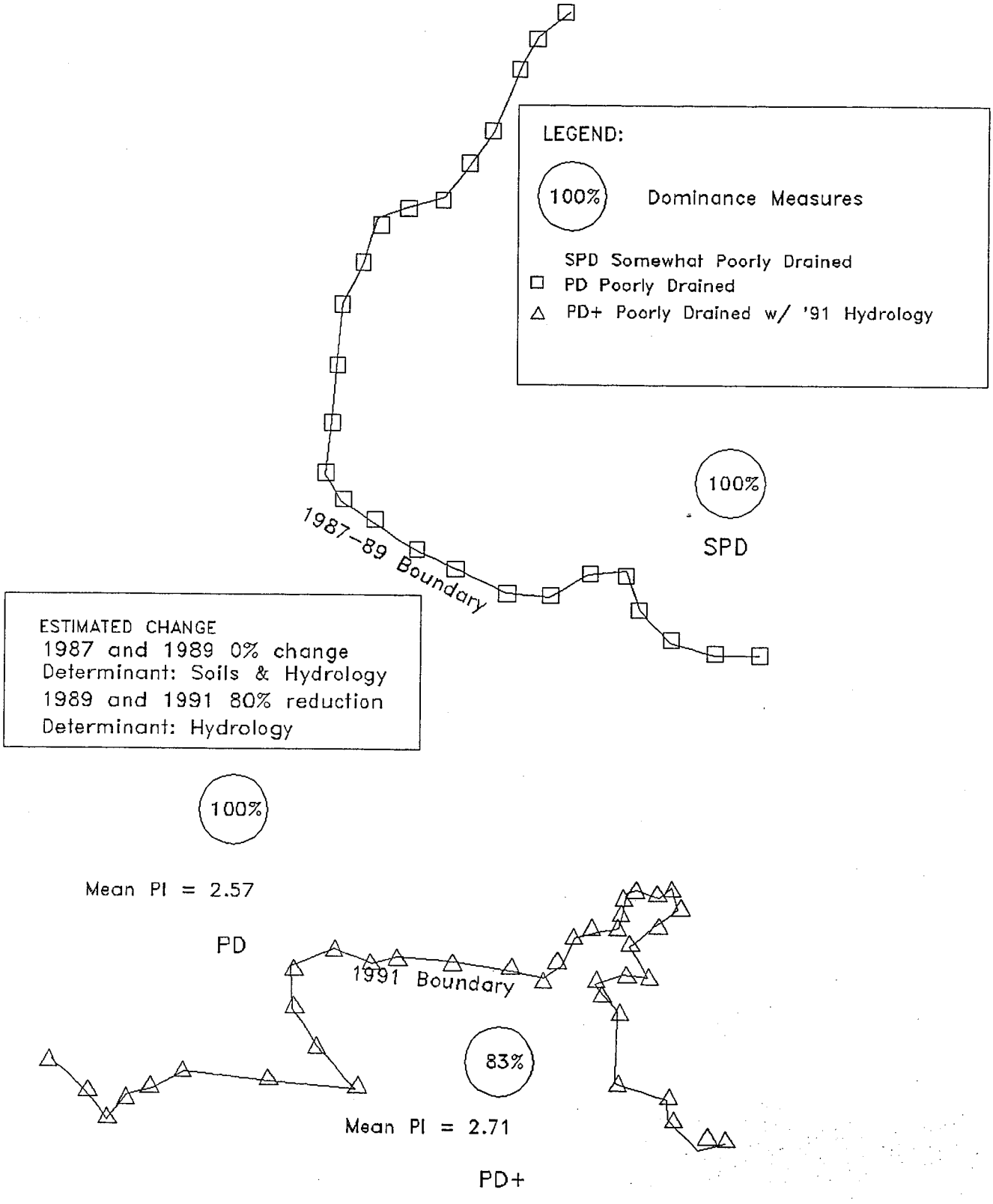
KEN


LEGEND
20% Dominance Measures
SPD (H) Somewhat Poorly drained (Hydric)
PD Poorly Drained
VPD Very Poorly Drained
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants, Soils & Hydrology
1989 and 1991 30% reduction
Determinant: Hydrology
1991 Boundary
1987-89 Boundary
50%
80%
SPD + MWD
Mean Pi = 2.68
SPD(H)
71%
Mean PI = 2.56
PD
VPD

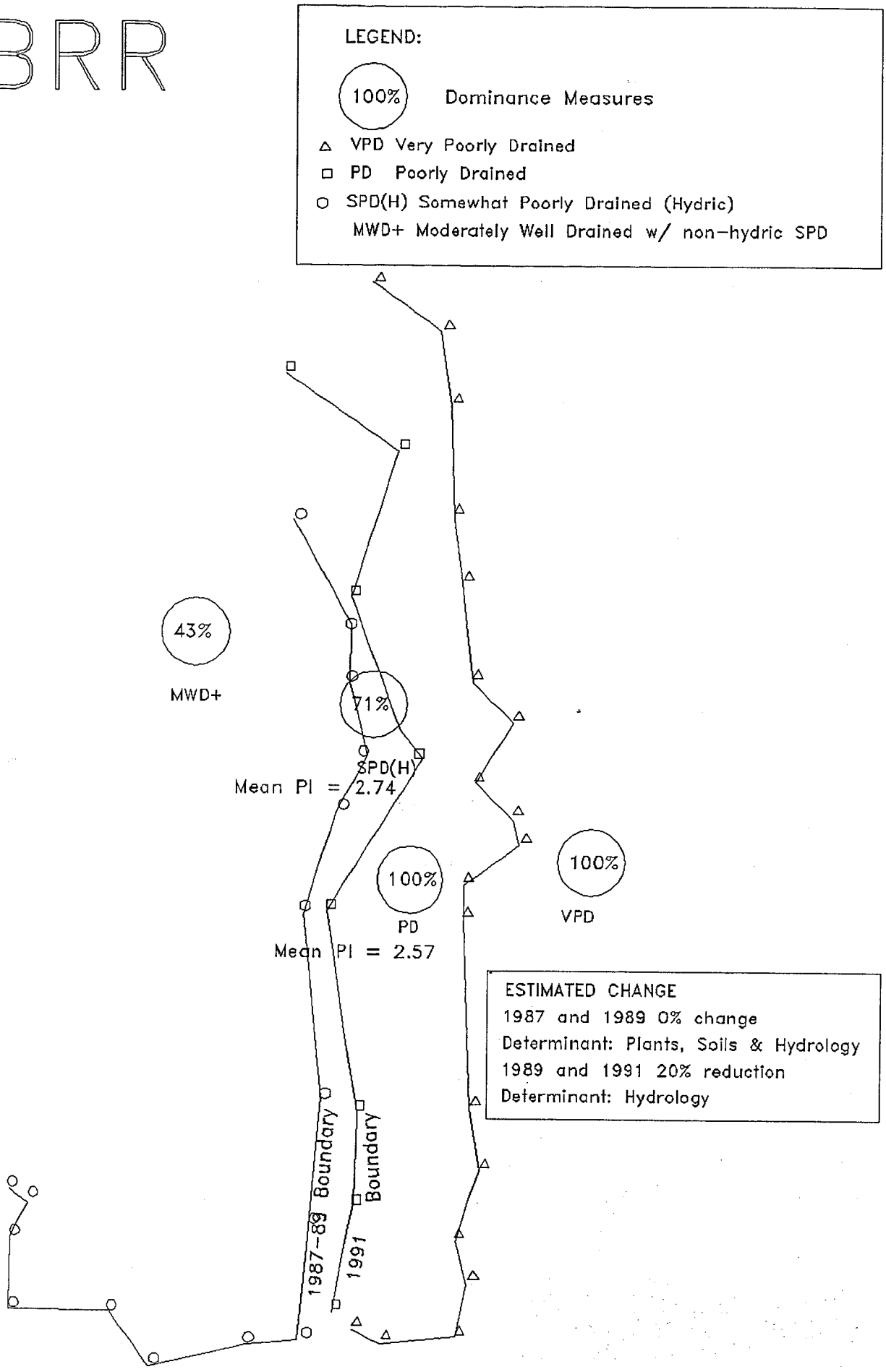
BRF


100%
Mean PI = 2.64
SPD/PD
LEGEND:
100%
Dominance Measures
MWD Moderately Well Drained
SPD/PD Somewhat Porly Drained with Poorly Drained Inclusions
SPD Somewhat Poorly Drained
SPD(H) Somewhat Poorly Drained (Hydric)
PD(H) Poorly Drained with alterd Hydrology
100%
SPD
1987-89 Boundary
1987-89 Boundary
SPD(H)
91%
MWD
Mean PI = 2.61
1987,89,91 Boundary
PD(H)
ESTIMATED CHANGE
1987-89 0% change
Determinant: Soils & Hydrology
1989-91 90% reduction
Determinant: Hydrology

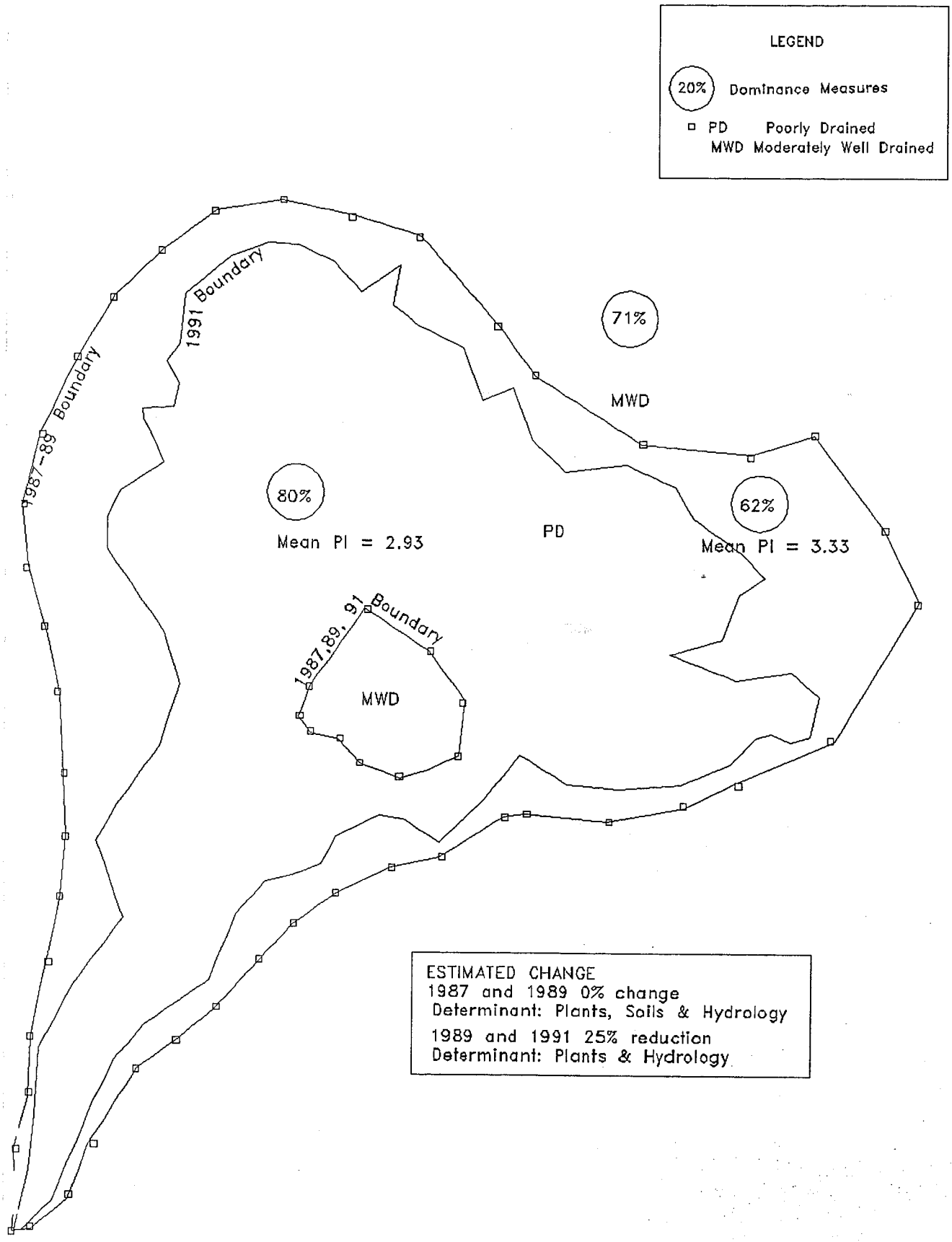
SAK


LEGEND:
100%
Dominance Measures
SPD Somewhat Poorly Drained
PD Poorly Drained
PD+ Poorly Drained w/ '91 Hydrology
100%
SPD
1987-89 Boundary
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Soils & Hydrology
1989 and 1991 80% reduction
Determinant: Hydrology
100%
Mean PI = 2.57
PD
1991 Boundary
83%
Mean PI = 2.71
PD+

BRR


LEGEND:
100%
Dominance Measures
VPD Very Poorly Drained
PD Poorly Drained
SPD(H) Somewhat Poorly Drained (Hydric)
MWD+ Moderately Well Drained w/ non-hydric SPD
43%
MWD+
71%
SPD(H)
Mean PI = 2.74
100%
PD
Mean PI = 2.57
100%
VPD
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants, Soils & Hydrology
1989 and 1991 20% reduction
Determinant: Hydrology
1987-89 Boundary
1991 Boundary

RUT


LEGEND
20% Dominance Measures
PD Poorly Drained
MWD Moderately Well Drained
1987-89 Boundary
1991 Boundary
71%
MWD
80%
Mean PI = 2.93
PD
62%
Mean PI = 3.33
1987,89, 91 Boundary
MWD
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants, Soils & Hydrology
1989 and 1991 25% reduction
Determinant: Plants & Hydrology

ADD

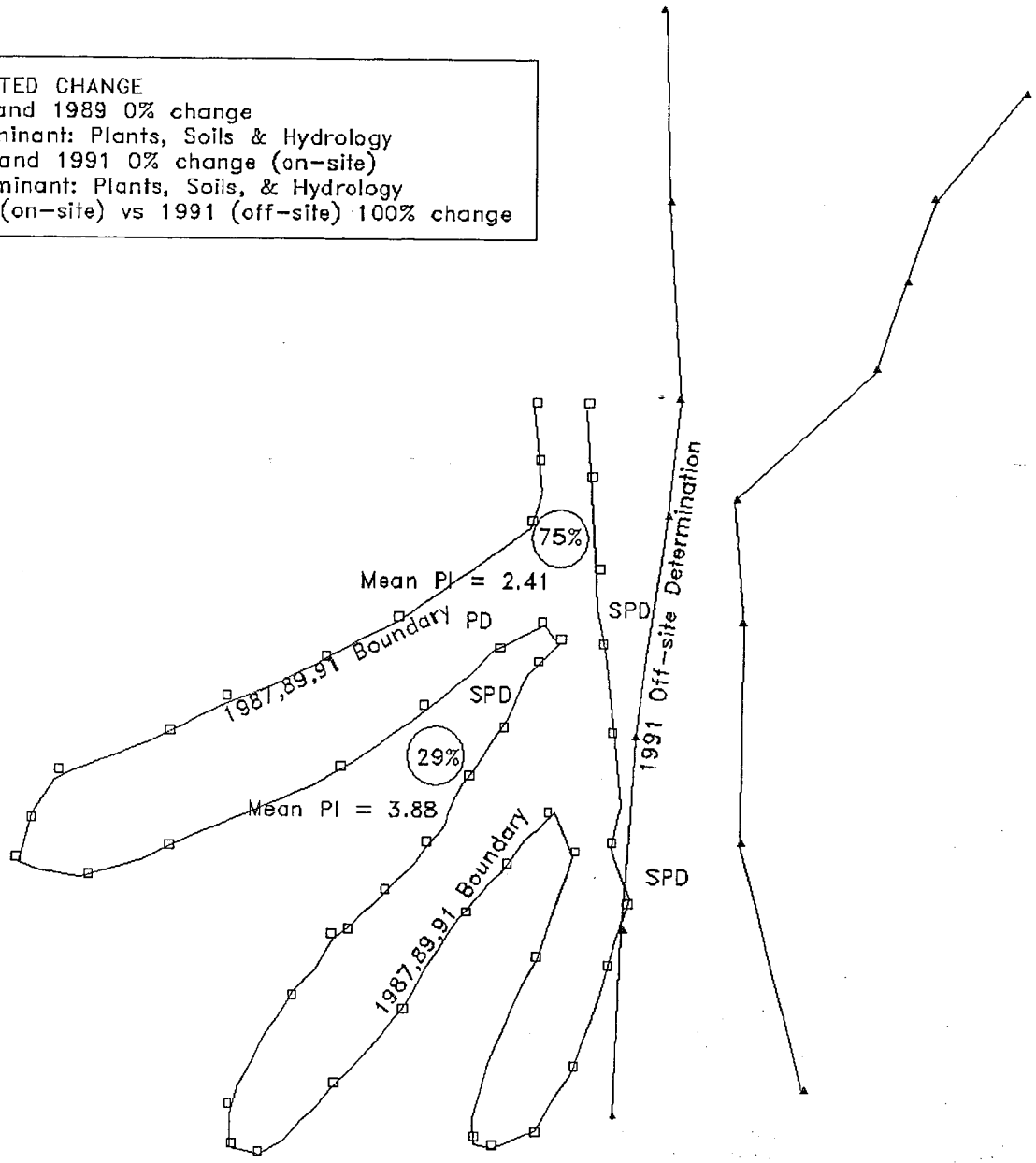
LEGEND

(20%) Dominance Measures

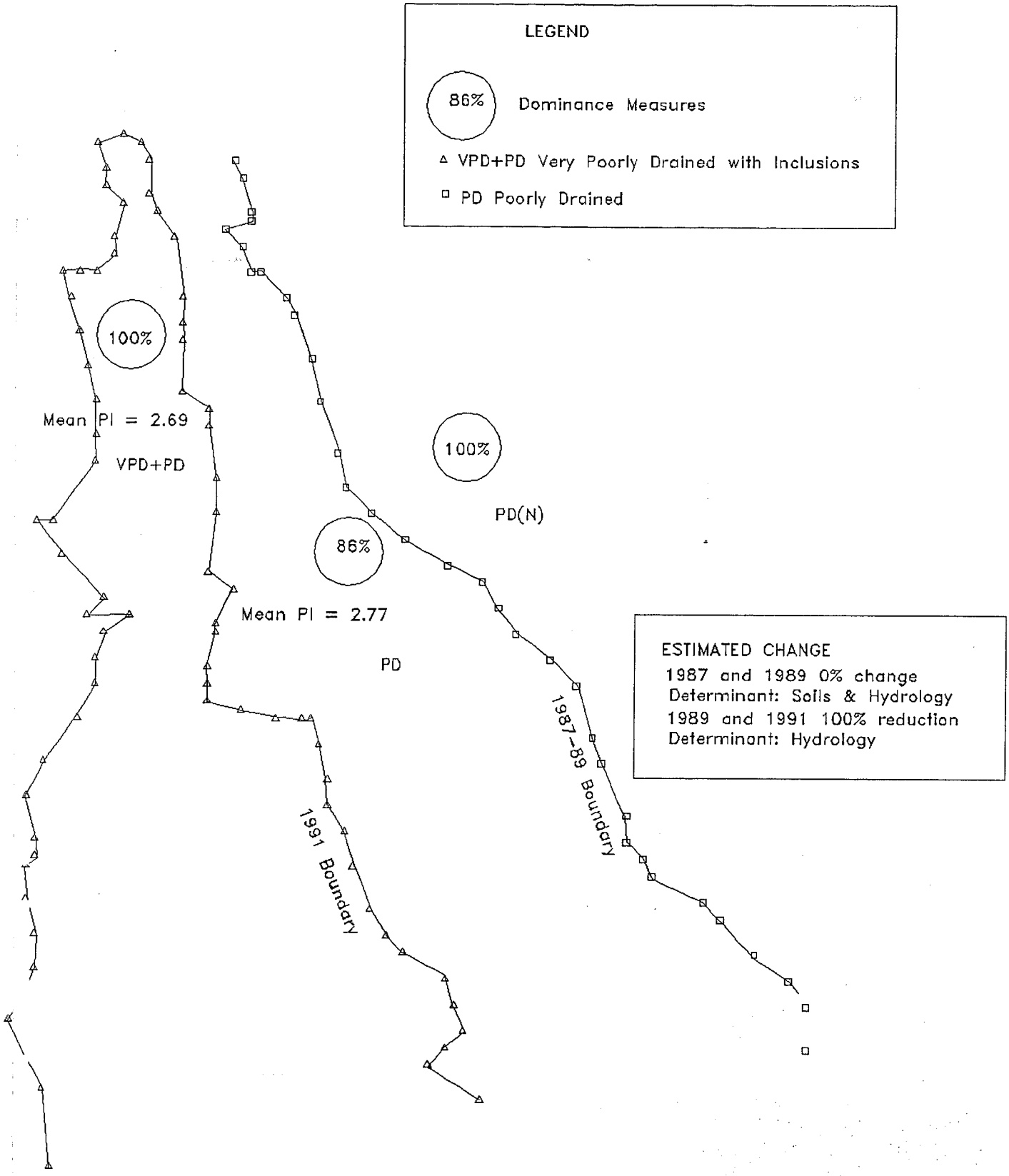
PD Poorly Drained

▲ Off-site Determination for FSA purposes

ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Plants, Soils & Hydrology
1989 and 1991 0% change (on-site)
Determinant: Plants, Soils, & Hydrology
1991 (on-site) vs 1991 (off-site) 100% change



CAB


LEGEND
86% Dominance Measures
VPD+PD Very Poorly Drained with Inclusions
PD Poorly Drained
100%
Mean PI = 2.69
VPD+PD
100%
PD(N)
86%
Mean PI = 2.77
PD
1991 Boundary
1987-89 Boundary
ESTIMATED CHANGE
1987 and 1989 0% change
Determinant: Soils & Hydrology
1989 and 1991 100% reduction
Determinant: Hydrology

APPENDIX C: Wetland Functions and Values: Representative Field Site Slides and Narrative Description

This narration corresponds to the above slides documenting the 18 field sites visited in New England.

Wetland Functions and Values: The team delineated wetlands according to the Corps' 1987 protocol, as well as the 1989 and the proposed 1991 versions of the Federal (Interagency) Manual. Comparing the proposal against delineations under the former versions, jurisdiction will be significantly contracted under the 1991 translation. The following narration corresponds to 54 slides documenting conditions at each of the 18 field sites. Included in the narration are brief discussions of principal valuable functions of the resources that will be abandoned by the proposed delineation manual.

01: TRI: In compact till derived from iron-rich Triassic sandstones, an usually dense understory of spicebush marks the portions of the red maple swamp that will be lost to the 1991 proposal. A wide range of forest habitats are found in this broad transition. There is also a direct impact on public health when these shallow aquifers over till are contaminated by sewage and other domestic discharges.

02: TRI: The bare areas in the foreground delimit the 1991 wetland boundary; this is very poorly drained and is ponded early in the spring. Upslope in the background, the broad transition undergoes alternating cycles of fermentation and respiration; this gives it a higher bioremediation potential than either permanently saturated or permanently aerobic soils. This important resource can not be delineated under the proposed criteria.

03 UMO1: In the foreground, areas that will not be identified as wetlands under the 1991 proposal often have high species and structural diversity. These low-lying, these areas often serve a full complement of hydrologic and cultural functions.

04: UMO1: Even when the capillary fringe is effectively saturated, the squeeze and shake field tests may not be meaningful in fine textured soils within this swamp.

05: UMO1: In a landscape position comparable to this swamp, on the other side of the valley, active management maintains external drainage in these marine sediments and enables them to be planted in forage crops.

06: UMO2: Here, on the other side of the valley, a history of wetness is evident immediately below the plow zone; however, these marine silts have been sculpted by modern agriculture and water is shed before it penetrates deeply into the soil. In New England, such areas are not considered wetlands in their present condition; yet, without active management, it is likely that surface roughness and wetness would increase.

07: UMO2: Just downslope from the preceding slide, in the edges of the hayfield, a thick, dark plow layer, and strongly mottled subsoil are evidence of long term ponding and saturation.

08: UMO2: Here, the site of the preceding soil profile is frequently ponded. In addition to water quality functions, these wet hayfields offer a wide range wetland functions ranging from seasonal habitat to flood storage. Many such sites will lose regulatory consideration under the 1991 proposal.

09: UMO2: The interface between wet hayfields and wetlands.... Receiving heavy applications of liquid manure, these wet transitions are important sites for denitrification. Many areas like these will not satisfy the proposed wetlands criteria.

10: MCD: The 1991 proposal abandons huge acreage of low-lying forests.

11: MCD: This transition near the floodplain represents highly diverse habitats. These areas offer the full range of wetland functions even though they are not recognized as such in the 1991 version of the delineation manual.

12: MCD: Again, only the lowest and wettest forest in the very poorly drained position of the landscape are considered wetlands under the proposed manual.

13: LQR: Determining a Prevalence Index (PI) is extremely arduous, and averaged more than 10 manhours for each site. Heavy wind damage from a recent hurricane complicated data collection. This site is not wetland under the 1991 protocol; yet, the team estimated more than 20% of the forest exhibited wind throw due to shallow roots which is good evidence of a high water table.

14: LQR: Well data and soil morphology suggest that this site is wet for a month or more early in the season. This diverse red maple swamp, however, does not fall below the 3.0 Prevalence Index threshold. Lying above a shallow aquifer on compact till, these intermittently wet areas are extremely valuable to the surface waters in this watershed. Such areas may be more valuable than permanently saturated sites in remediating water contaminated by domestic discharges. Human pathogens are consumed by protozoans, a broad spectrum of organic substances may be degraded or detoxified, and inorganic contaminants may be transformed or immobilized.

15: LQR: Hydric soil photography was nearly impossible on most sites due to low light conditions and the inherent colors of hydric soils.

16: WEB: Shallow to bedrock, water in these wetlands is ephemeral and evident here as leafdrop begins. Much of the lower open area will not satisfy the severe saturation thresholds proposed in 1991.

17: WEB: In the wettest portions of the resource, organic soils, saturation and pale laurel enable us to consider it a wetland in all versions of the manual.

18: WEB: High in the watershed and shallow to bedrock, this wetland experiences extremes of draught and saturation, making this ephemeral pool an inhospitable medium for vascular plants. For indigenous wildlife as well as migrating songbirds, these wet areas are a critical source of freshwater. In the Spring, these pools provide breeding areas for large populations of amphibians.

19: WEB: Sheep laurel dominates and hides small "vernal/autumnal" pools in some portions of the 1987-89 wetland. A sanitary landfill is being considered in the watershed above. The enzymatic potential is high in the surrounding wetlands that may ultimately receive drainage from a landfill. Regardless of whether that discharge is incidental or deliberate, these wetlands will be extremely valuable for the bioremediation of water containing a wide array of organic compounds and human pathogens.

20: PLI: Here, in close proximity to vast tidal marshes and flats, an interdunal shrub swamp offers valuable shelter and freshwater along the coastal flyway. Only the herbaceous zone (the narrow zone between the red flags) in the lowest and wettest portions of this irreplaceable resource will be regulated as a wetland if the 1991 proposal remains unchanged.

21: PLI: Strong organic streaking and layering confirm that this site undergoes long periods of wetness. A shallow lens of freshwater floats above saltwater. Where this freshwater breaks the surface, it is a precious commodity to a wide assortment of birds and terrestrial organisms living among the scorching dunes.

22: PLI: Here, rust zones on a galvanized duck box demonstrate that water pools at some time during the year. If the wildlife biologists planned things right, surface water is present in the Spring while the ducks are using the box. The margins that shield this resource will not be considered wetlands under the 1991 proposal.

23: WIL: Using the point intercept method, vegetation analysis was inconclusive. In recently disturbed areas like this, high diversity is common to early succession. This greatly increases the investment of time and energy without yielding meaningful frequency analysis data. The team endorses using dominance measures as a more efficient vegetation sampling protocol. Situated along a flash-flooding urban stream these wetlands are extremely important hydrologic features in the floodplain. Immediately downslope from greenhouses and a large commercial vegetable farm, these wetlands are sites for denitrification of fertilizers and degradation of other agricultural contaminants. The site is used by many herptiles and waterfowl.

24: RBB: Most wetland functions are offered in this overflow forest along the Connecticut River. Yet, the 1991 proposal will abandon all but the wettest meander scars.

25: RBB: A meander scar in the dry.... Under the 1991 proposal, non-wetlands begin along the treeline on the left.

26: RBB: The same meander scar after an early Autumn storm. While the wet margins are subject to frequent flooding and reduction, they do not satisfy the 15 day inundation or 21 day saturation criteria.

27: EPP1: The 1991 proposed manual did not sustain a wetlands determination in the red maple swamp in the poorly drained soils left of the road.

28: EPP1: Earlier in the year from within the same red maple swamp.... In a lightly developed portion of a rural watershed, the principal valuable functions of this particular resource relate to wildlife habitat.

29: EPP1: The proposed vegetation and hydrology criteria will not sustain a wetlands determination in many traditionally acknowledged wetlands. The 1991 manual supported a delineation only within the very poorly drained interior of this red maple swamp.

30: EPP1: Using soil series to identify hydric soils may lead to some faulty conclusions. At this site, the soil was considered hydric based upon its field characteristics. However, the named series on the published survey is administratively controlled by another region of the country and is not considered hydric. This conflicting information would distort the regulatory process and lead to unnecessary delays.

31: EPP2: EPP1 lies in the left center of this frame. EPP2 involves the margin along the scrub-shrub and emergent wetlands of the river.

32: EPP2: The proposed manual abandons these low-lying transitional zones which offer a full range of hydrologic and habitat functions. This narrow margin is an important travel corridor for many animals. The treeline along the marsh is heavily used by song birds and raptors.

33: EPP2: Although this forested wetland is typically saturated in the spring and fall, the proposed hydrology criterion could not be satisfied during the summer site investigation. Water tables can and should be inferred from hydric soil morphology; yet, the proposed Regional Indicators of Significant Soil Saturation are inadequate for documenting hydrology in many common wetland types.

34: KEN: This swamp in very poorly drained soils is still a wetland under the 1991 proposal...

35: KEN: ...but, much of the adjacent wet forest will no longer be regulated as a wetland.

36: KEN: The concept of a "growing season" was developed largely around conventional agricultural practices. In New England, sugaring begins in February or March when days warm slightly above and nights drop below freezing. Anaerobiosis likely occurs in the portions of the root zone of wetlands throughout much of the year as long as it is saturated and unfrozen. "Growing season" bears little upon the biologically active period in wetlands.

37: BRF: Intermittently wet areas are extremely valuable in the retardation and transformation of nitrates and other agricultural contaminants. The cornfield and wetlands lie above a shallow aquifer on compact basal till. At the top of this ridge, a large subdivision contributes septic and other domestic discharges to the shallow aquifer. Wherever these subsurface waters break out, discharge wetlands are important sites for remediation of the water before it enters the surface tributary system.

38: BRF: The absence of woody vegetation in the foreground is evidence of the extreme wetness in areas that will remain wetlands under the 1991 proposal.

39: BRF: Agriculture and water stress have produced a habitat mosaic on this compact till slope. The open area in the lower left corner is the "vernal/autumnal" pool from the preceding slide.

40: SAK: Leafdrop has begun in the red maple swamp between the water course and the field in the left portion of the frame. These wetlands receive and process discharges from a vineyard and commercial winery. Various degrees of wetness within the wetland corresponds with zones of differing oxidation and reduction. This increases the ability to degrade or detoxify a range of contaminants. To relinquish regulatory jurisdiction over these important transitions will inflict an inordinate handicap on our ability to control the fate of our Nation's water.

41: SAK: Proposed primary hydrologic indicators and the regional indicators of saturation are not evident in much of this swamp. Although this swamp lies above the headwaters of the watershed, its receiving waters flow only a short distance before they reach the Sakonnet estuary and Rhode Island Sound. These swamps are especially important during migration along the Atlantic Coast Flyway. Insects attracted by the early flowering red maples and other trees provide an essential food source to warblers and other migrants.

42: SAK: Hydric soil morphology is often masked by dark parent materials found in parts of New England.

43: SAK: Severe wetness on the left is evident by the absence of an understory; this is an area where jurisdiction will be sustained by the proposed manual. The dense understory to the right is typical of areas that will lose regulatory consideration.

44: BRR: In the forested wetland to the left of the river, we estimate a 20% reduction in jurisdiction under the 1991 revisions. Near major Rhode Island cities, this resource is the site of a proposed federal project to provide water supply, flood control and recreation.

45: BRR: Under the 1991 proposal, the wetland boundary shifts closer to the shrub swamp along the river.

46: BRR: Leafdrop is often accompanied by a rapid rise in water tables due to decreased transpiration. While some of the proposed primary indicators of hydrology, such as observation of water and the squeeze test, may be present during the spring and fall, they are usually not useful during the summer. Additionally, anaerobiosis may be most active during the autumn, which falls outside the proposed growing season in some cases.

47: RUT: Dynamic hydrology produces extremely diverse communities. This wet meadow satisfies the vegetation criterion, but data collection and calculations for the prevalence index were extremely time consuming. In contrast, use of dominance measures to characterize vegetation at this site took about one-third of the time and effort.

48: RUT: In this wetland, species composition and dominance oscillate dramatically from season to season and year to year. Frequency analysis (PI) would range widely in this dynamic herbaceous community.

49: ADD: In this heavy clay soil, the wetland boundaries were the same for all versions of the manual. When off-site techniques were applied, these areas are difficult to identify from aerial photography and are often not identified as wetland. Agency staff are very uncomfortable about being expected to perform wetland delineations without the opportunity for site visits to confirm the signatures on aerial photography and other resources.

50: ADD: A significant fraction of the sedges beneath the dense growth were not identifiable at this time of year. This jeopardized valid frequency analysis of the site.

51: CAB: In New England's spruce-fir wetlands, the point-intercept data hovers around the 3.0 threshold in both the wetter and the drier portions of the landscape. The lower limits of this wetland lie within a large flood control project outside Vermont's capital. This site receives some non-point source runoff from a dairy farm and may offer some detritrification opportunity.

52: CAB: Wetness morphology is masked by the darkness of the minerals that predominate this parent material.

53: CAB: This soil is wetter than the previous slide, as evidenced by the darkness of the topsoil.

54: CAB: Often, the torrential nature of spring runoff is better reflected in the uplands than it is in glacial till wetlands.

NEW ENGLAND

01 [redacted]	02 [redacted]	03 [redacted]	04 [redacted]
05 [redacted]	06 [redacted]	07 [redacted]	08 [redacted]
09 [redacted]	10 [redacted]	11 [redacted]	12 [redacted]
13 [redacted]	14 [redacted]	15 [redacted]	16 [redacted]
17 [redacted]	18 [redacted]	19 [redacted]	20 [redacted]

NEW ENGLAND

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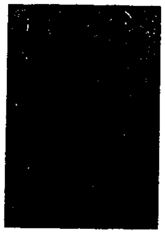

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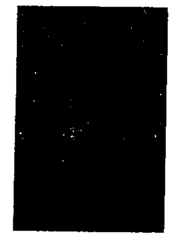

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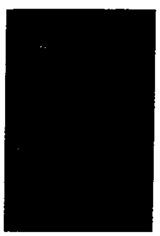

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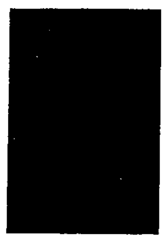

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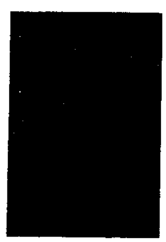

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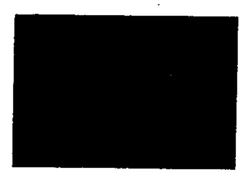

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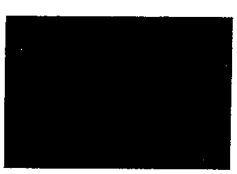

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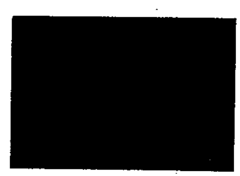

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NEW ENGLAND REGION

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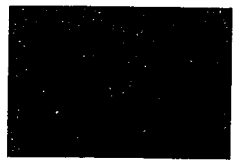

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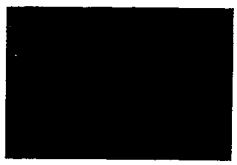

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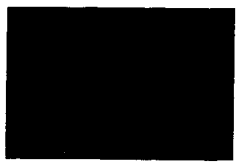

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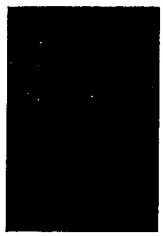

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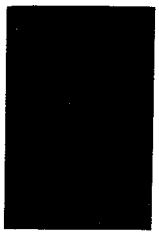

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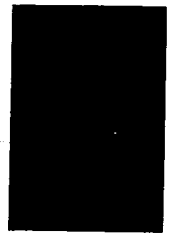


APPENDIX D: New England Guidelines for Soil Drainage Class Determinations (Operational Draft)

DRAFT

CENED-OD-R (1145-2-303B) 9 September 1991

MEMORANDUM THRU Chief, Policy Analysis Branch

FOR Chief, Regulatory Division, Operations Directorate

SUBJECT: Guidance for the Interpretation of Wetland Boundaries Using the 1987 Corps Manual in the Six New England States

1. On July 4, 1989 this Division disseminated a public notice announcing the "Mandatory Technical Criteria" from the Federal Manual for Identifying and Delineating Jurisdictional Wetlands. It described a format and a protocol to be used by our staff to support wetland jurisdictional determinations throughout New England. During the two years since that notice, this Division has reviewed or generated documents for innumerable wetland delineations. While the 1989 form was a vast improvement over earlier formats, our staff has noted many inadequacies. I have also received countless comments and suggestions from the regulated public, scientists and other professionals outside the Corps of Engineers. As you know we are now required to use the Corps of Engineers Wetlands Delineation Manual (1987 Manual) However, the technical criteria for hydric soils are the same in both manuals. The efforts made to refine our use of the 1989 Manual are still of value since the information can also be used with the 1987 Manual. I have attached a draft revised dataform for use with the 1987 Manual. We issued a public notice on September 4, 1991 that supersedes the 1989 public notice and informs the public of the required use of the 1987 Manual.

2. A basic weakness in the Mandatory Technical Criteria found in the 1989 Manual has been the use of soil drainage classification. In the past, this interpretation related to agricultural use and did not require any level of precision. Throughout New England, interviews with hundreds of soil scientists suggests that most of them use soil morphology to determine drainage class; yet, the range of their differences has made it difficult to uniformly interpret soils throughout our region. In the recent past, our staff was augmented by Soil Scientist Peter Fletcher under contract from the U.S. Soil Conservation Service in Massachusetts. Peter collated the regional concepts of soil drainage classification and enabled us to develop concise guidelines and a revised dataform for use by our staff. These guidelines for soils determinations and the dataform are consistent with the 1987 Manual. By putting our ongoing operating concepts into text and illustrations, I expect improved consistency among our staff in their field interpretations. Consistency and predictability are in the interest of the regulated public.

CENED-OD-R
SUBJECT: Guidance for the Interpretation of Wetland Boundaries Using the 1987 Corps Manual in the Six New England States

3. The enclosed materials have considered the views of numerous experts from our region. It is my belief that nobody knows New England wetlands better than its community of practicing wetland scientists. The final products may not address every concern; nevertheless, without holding them completely accountable, I am grateful to the following for their continuing contributions and criticisms: Jim Gove, Steve Hundley, Norman Kalloch, Kipen Kolesinskas, Dr. Harvey Luce, Kenneth LaFlamme, Tom Peragallo, Sid Pilgrim, David Rocque, Jerry Rosenburg, Dick Scanu, Frank Smigelski, Matt Schweisburg, Chris Smith, Ralph Tiner, David Van Houten, Dr. Peter L.M. Veneman, Thomas Villars, Dr. William R. Wright. We are also indebted to the Soil Conservation Service staff in each of the six New England States for escorting our staff to the field and sharing their insights and interpretations on numerous unique and difficult soils. I also thank the Maine Association of Professional Soil Scientists, the Societies of Soil Scientists of Southern and Northern New England, the New England Chapters of Soil and Water Conservationists; as well as the New Hampshire Association of Consulting Soil Scientists, the New Hampshire Association of Wetland Scientists, and the New Hampshire Board of Certification of Natural Scientists. Several hundred of the members of these organizations participated in the field examination of versions of the enclosed materials.

Michael J. Sheehan
Senior Wetland Scientist
Environmental Resources Section

Enclosures:

1. Wetland Delineation Guidelines
    a. Performance Standards and Supplemental Definitions
    b. Sample Wetland Delineation Dataform
    c. Sample Illustration of Wetland Delineation Details
    d. Blank -- Delineation Dataform -- Version 24Aug91
2. Guidelines For Soil Drainage Class Determinations
   Operational Draft [Text Version 27Feb91, Illustrations 1Aug91]
3. Soil Interpretation References -- Addresses
4. Important Resource Information -- Addresses

PERFORMANCE STANDARDS AND SUPPLEMENTAL DEFINITIONS FOR USE WITH THE 1987 CORPS MANUAL

KNOWN STATION -- an easily recognizable, accessible and reasonably permanent cultural or natural feature used as a reference point for horizontal survey control and included with the plan of the project site. A known station must be available within 1000 feet of recorded observation plots. Where such reference points are not available, known stations should be established by land survey, visibly marked and illustrated on the plan view. The land survey must be verifiable with an accuracy of 1/500 ratio of error.

BASELINE -- A wetland survey control feature used to establish and recover locations of transects and observation points. It is usually parallel to the water course or perpendicular to the hydrologic gradient. The length of the baseline may be used to guide the minimum number of transects.

TRANSECT -- A line on the ground along which observations are made. Transects are used to represent conditions along the boundary of federal jurisdiction. The number of transects must be sufficient to insure that all plant community types in the impact area along the wetland/nonwetland interface are revealed in the sampling. Generally, transects will be sampled at a rate of 3 per linear mile of baseline and increase at a rate of 1 transect per additional 0.5 mile of baseline length. Ideally, the intervals between transects should be equal; however, this consideration is subordinate to the stated need to sample all plant community types and represent conditions in close proximity to the areas of the most direct impacts.

OBSERVATION PLOT -- Sites along a transect where the details about vegetation, soils and hydrology are observed and recorded. Minimally, one observation plot upgradient and another downgradient from the wetland boundary will be recorded. Together, these two points are the delineator's reasoning behind his wetland boundary. Consequently, it's important that these plots are fair representations of the site conditions along the boundary. It's also important that the two documented plots can be recovered and confirmed by the authenticating agency. Ideally, the centers of these 2 plots should be in the range 5 to 15 feet from one another. Record plot locations must be recoverable from a known station.

VEGETATION SAMPLING: -- 6 strata are defined:

A. WOODY OVERSTORY: stems in 30-ft. radius from center of observation point
   1. TREES -- woody, nonclimbing, at least 5.0in. dbh (diameter at breast height) and at least 20ft. tall.
   2. LIANAS -- woody vines, climbing on trees, shrubs or saplings.

B. WOODY UNDERSTORY: foliage in 15-ft. radius from center of observation plot
   3. SAPLINGS -- woody, nonclimbing, at least 0.4in., but less than 5.0in. dbh, and at least 20ft. tall.
   4. SHRUBS -- woody, nonclimbing, at least 3ft.tall, but less than 20ft. tall

C. HERBACEOUS UNDERSTORY: foliage in 5-ft. radius from center of observation plot
   5. SEEDLINGS & HERBS -- woody, less than 3ft. tall, or nonwoody (any height)
   6. MOSSES & LIVERWORTS -- Only when considered an important component of the community

DOMINANT VEGETATION -- Using the dominance measures below, estimate and list the species in each stratum of the plot that, when ranked in descending order of abundance (i.e. Percent Dominance) and cumulatively totalled, immediately exceeds 50% of the total dominance measure for the stratum plus any additional species that comprise 20% or more. of the dominance measure for that stratum.

DOMINANCE MEASURES -- as indicated for the strata below:

Trees -- BASAL AREA (i.e. the cross sectional area at BREAST HEIGHT (4.5 ft.)

Lianas -- number of stems (i.e. at ground level) or basal area, as appropriate

Other Strata -- percent areal coverage (i.e. estimated peak growing season foliage)

TOTAL DOMINANCE MEASURE -- the sum of the dominance measure of all species in a stratum.

PERCENT DOMINANCE -- The sum of the dominance measure of a species divided by total dominance measure for a stratum, expressed as a percent. For example -- the total cover by Carex stricta compared to the total cover of all species in the herb layer.

HYDROPHYTES are considered to be prevalent when more than 50% of the list of dominant vegetation are within the range OBL through FAC on the current National List of Plant Species That Occur in Wetlands: Northeast (Region 1). NOTE: FAC-, FACU and UPL species are considered hydrophytes when observable morphological or physiological adaptations to wetland hydrology are found in the observation plot. Except FAC-, the other + and - signs may be ignored when processing the wetland indicator status data, i.e. OBL-, FACW+, FACW-, FAC+, FACU+, FACU- are considered OBL, FACW, FAC and FACU, respectively.

OBSERVABLE PLANT ADAPTATIONS TO WETLAND HYDROLOGY:

Pneumatophores	Buttressed Trees	Hypertrophied Lenticels
Stooling	Adventitious Roots	Inflated Leaves, Stems, or Roots
Shallow Root Systems	Floating Leaves	Rhizospheric Oxidation
Polymorphic Leaves	Floating Stems	

HYDRIC SOIL -- a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

SOIL SURFACE -- For organic soils (Histosols) or mineral soils with a thick organic surface layer (histic epipedon), the soil surface is the uppermost organic horizon or layer that is, or has been, saturated for prolonged periods. Otherwise, the soil surface is the top of the mineral soil. (This will be used to describe the depth to the horizons or layers, and their thickness.)

WETLAND HYDROLOGY -- permanent or periodic inundation, or soil saturation for a significant period (usually two weeks or more) during the growing season.

NOTE: This form reflects changes that are consistent with the substance of the Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1) January 1987

FOR USE WITH 1987 CORPS WETLANDS DELINEATION MANUAL

SOIL DETERMINATION

NOTE:
1. "NO" in all the following is evidence that the soil is NOT HYDRIC
2. This checklist is valid for use by the New England Corps of Engineers; use outside the six New England States may be inappropriate.
3. This interpretive routine may be inappropriate in unusual cases.

Yes No

☐ ☑ Soil is frequently PONDED or FLOODED for a duration longer than two weeks during the growing season. (attach an explanation of the basis for your conclusions).

☐ ☑ The soil meets the Corps of Engineers regional criteria as a VERY POORLY DRAINED SOIL* and there is no evidence of altered hydrology.

☑ ☐ The soil meets the Corps of Engineers regional criteria as a POORLY DRAINED SOIL* and there is no evidence of altered hydrology.

☐ ☑ The soil meets the Corps of Engineers regional criteria as a SOMEWHAT POORLY DRAINED SOIL that has either of the following two characteristics*:

Yes NO

☐ ☐ 1. Within 6 inches of the soil surface there are:

Yes No

☐ ☐ a. soil mottles within an A or Ap horizon and the subsoil is mottled throughout; OR

☐ ☐ b. common to many, distinct or prominent mottles with a matrix of chroma 3 or less; OR

☐ ☐ c. distinct or prominent oxidized rhizospheres and the subsoil is mottled throughout.

☐ ☐ 2. Within 24 inches of the soil surface, there are mottles which are common to many, distinct or prominent, and that are chroma 2 or less, and one of the following:

Yes No

☐ ☐ a. In the horizon that lies within 10 inches of the soil surface and directly beneath a dark** A or Ap horizon, the matrix is chroma 3 or less; the mottles are at least 10% in abundance and distinct or prominent.

☐ ☐ b. When a dark** Ap horizon is between 10 and 14 inches thick, wetness morphology may be masked by organic matter. Normally, these problem situations will be considered hydric when: i. hydrophytes are prevalent, ii. there is no evidence of altered hydrology, and iii. in the horizon that lies directly beneath the Ap horizon, the matrix color is chroma 3 or less and mottles are at least 10% in abundance and distinct or prominent.

☐ Check here and attach a description of your procedures and conclusions if one of the following options were chosen for your hydric soil determination: measured redox potentials, colormetric test for ferrous iron test ($\alpha,\alpha,-$Dipyridil), or other measurements and observations.

* Typically in New England, soils having these morphologies will be classified in an aquic suborder or an aquic subgroup in soil taxonomy.
** Note: a dark A or Ap is defined as having a value of 3 or less and a chroma of 2 or less

Remarks:

NOTE: This form reflects changes that are consistent with the substance of the Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1) January 1987

Wetland Delineation Dataform -- Version 24AUG91

DATA & DETERMINATION HYDROLOGY

NOTE:
1. Hydrology is often the most difficult feature to observe.
2. Interpretations must consider the appropriateness of the observations in light of the season, recent weather conditions, and watershed alterations, etc.
3. Interpretation of hydrology may require repeated observations over more than one season.

☐ Recorded Data:

Stream, lake or tidal gage — Identification: _____

Aerial Photograph — Identification: _____

Other — Identification: _____

☑ No Recorded Data Available

REPORT ANY OF THE FOLLOWING OBSERVATIONS:

Depth to Free Water: 8"

Depth to Saturation: Saturated to surface

Describe Altered Hydrology: None

☐ Inundated

☑ Saturated in upper 12 inches

☐ Water Marks

☐ Drift Lines

☐ Sediment Deposits

☑ Drainage Patterns within Wetlands

Remarks:

CONCLUSIONS

Project Title: Martel Catabolism Inc.

Delineator: Bub Sixpack

Transect: T2 Plot: 2 Date: 1 Nov. 91

	Yes	No		Yes	No
Greater than 50 Percent Hydrophytes?	☒	☐			
Hydric Soils Criterion Met?	☒	☐			
Wetland Hydrology Present?	☒	☐	IS THIS DATAPOINT WITHIN A WETLAND?	☒	☐

Remarks: The recorded upland datapoint, T2 - 1 is approximately 35' due South. The wetland boundary is 10' due South in the vicinity of boundary flag # 7

FOR USE WITH 1987 CORPS WETLANDS DELINEATION MANUAL

Project Title: Martel Cafo-bolism, Inc. File Number:

Transect: T2 Plot: 2 Date: 1 Nov 91

DATA -- VEGETATION	Stratum and Species (DOMINANTS ONLY)	Dominance Ratio	Percent Dominance	NWI Status
Tree	Acer rubrum	32%/440	73	FAC
	Pinus strobus	120/440	27	*FACU
Liana	Smilax glauca	several	100	FACU
Sapling	Acer rubrum	63/72	88	FAC
Shrub	Clethra alnifolia	10.5/21	50	FAC+
	Vaccinium corymbosum	10.5/21	50	FACW
Herb	Osmunda cinnamomea	10.5/36	29	FACW
	Clethra alnifolia	10.5/36	29	FAC+

Note: use asterisk * to indicate FAC-, FACU, or UPL species with observed adaptions to wetland hydrology

TALLY (Dominants ONLY)

OBL	FACW	FAC	*FAC-	*FACU	*UPL	FAC-	FACU	UPL
0	2	4		1			1	

SUBTOTAL (HYDROPHYTES): 7 SUBTOTAL: 1

TOTAL: 8

100 x SUBTOTAL (HYDROPHYTES) / TOTAL = 100 x 7/8 = 88 = PERCENT HYDROPHYTES

DESCRIBE VEGETATION DISTURBANCE: None

DESCRIBE ADAPTATIONS: Shallow root system

Wetland Delineation Dataform -- Version 24JUG91

NOTE: This form reflects changes that are consistent with the substance of the Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1) January 1987

DATA -- SOIL Soil Taxonomy: Aeric Haplaquept

Corps of Engineers Regional Drainage Class: Poorly Drained Criterion: B 3b (1)

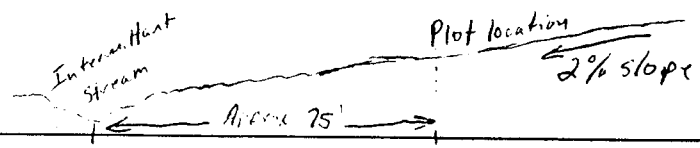
Is Published Soil Survey Available? Yes ☒ No ☐ Title/Date: Wazoo Co. 1 Apr. 190

Soil Type Mapped: Ridgebury fine sandy loam Field Observations Confirm Type Mapped? Yes ☒ No ☐

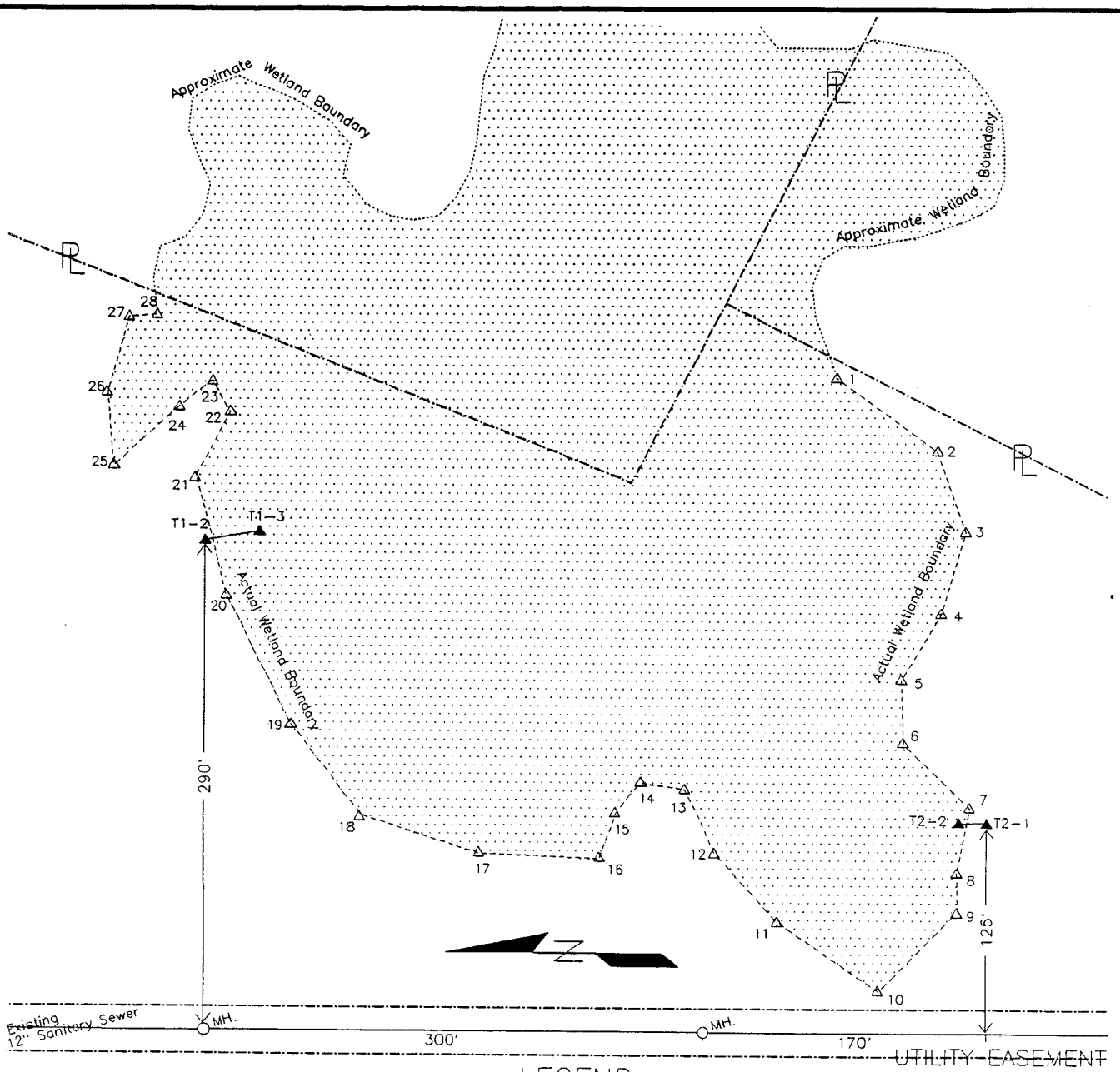
Depth inches	Horizon	Matrix Color (Munsell, Moist)	Color of Mottles (Munsell, Moist) Abundance/Contrast	USDA Texture, iron or manganese nodules or concretions, restrictive layers, root distribution, oxidixed rhizospheres, etc.
3-2	Oi	-	-	fibric (maple leaves, pine needles)
2-0	Oa	5YR 2.1/1	-	sapric
0-3	A	10YR 2/1	-	fsl, oxidized root channels, many med. + coarse roots
3-9	Bw	10YR 5/3	2.5Y 5/2 md	fsl, common fine + v. fine roots in upper part, no roots below
9-20	Bg	2.5Y 5/2	10YR 5/4 fp	fsl
20-30	Cd	2.5Y 5/4	10YR 5/2	fsl, compact basal till (restrictive layer)
≥ 30	-	-	-	- Not observed, below 30"

Remarks: Pit + mound topography, pits comprise more than 50% of the surface area. Profile describes typical pit. This data point is approximately 75' from intermittant stream

Sketch Landscape Position:



Contour and project features have been removed to illustrate ground controls and recoverable points.



LEGEND:

- Property Boundary
- Approx. Wetland Limits
- Actual Wetland Limits
- 10△ Wetland Flags
- T6-4 / T6-5 Transect & Datapoints
- 0 50 100 SCALE IN FEET
- Sanitary Sewer used as Baseline
- MH. Manhole used as Known Station

PURPOSE:
Regional Flea Market for the Culturally Disadvantaged
DATUM: NGVD = 0.0
ADJACENT PROPERTY OWNERS:
1. Willie Prophet
2. Reginald O'Day

DETAILS OF WETLAND DELINEATION

MARTEL CATABOLISM INC.
P.O. Box 404B
Wazoo, MA 02254

LANDSCAPING IMPROVEMENTS
IN: Wetlands adjacent to Fetid Brook
AT: Quasi, MA
COUNTY OF: Whatnot
APPLICATION BY:
Daniel Martel, Esq.

 DATE: 1 NOV 91

FOR USE WITH 1987 CORPS WETLANDS DELINEATION MANUAL

Project Title: File Number:

Transect: Plot: Date:

DATA -- VEGETATION	Stratum and Species (DOMINANTS ONLY)	Dominance Ratio	Percent Dominance	NWI Status

Note: use asterisk * to indicate FAC-, FACU, or UPL species with observed adaptions to wetland hydrology

TALLY (Dominants ONLY)

OBL	FACW	FAC	*FAC-	*FACU	*UPL	FAC-	FACU	UPL

SUBTOTAL (HYDROPHYTES): _____ SUBTOTAL: _____

TOTAL: _____

$\frac{100 \times \text{SUBTOTAL (HYDROPHYTES)}}{\text{TOTAL}}$ = _____ = PERCENT HYDROPHYTES

DESCRIBE VEGETATION DISTURBANCE:

DESCRIBE ADAPTATIONS:

NOTE: This form reflects changes that are consistent with the guidance of the Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1) January 1987

Wetland Delineation Dataform -- Version 2AKLJG91

DATA -- SOIL Soil Taxonomy:

Corps of Engineers Regional Drainage Class: Criterion:

Is Published Soil Survey Available? Yes ☐ No ☐ Title/Date:

Soil Type Mapped: Field Observations Confirm Type Mapped? Yes ☐ No ☐

Depth	Horizon	Matrix Color (Munsell, Moist)	Color of Mottles (Munsell, Moist) Abundance/Contrast	USDA Texture, iron or manganese nodules or concretions, restrictive layers, root distribution, oxidixed rhizospheres, etc.

Remarks:

Sketch Landscape Position:

FOR USE WITH 1987 CORPS WETLANDS DELINEATION MANUAL

SOIL DETERMINATION

NOTE:
1. "NO" in all the following is evidence that the soil is NOT HYDRIC
2. This checklist is valid for use by the New England Corps of Engineers; use outside the six New England States may be inappropriate.
3. This interpretive routine may be inappropriate in unusual cases.

Yes No

☐ ☐ Soil is frequently PONDED or FLOODED for a duration longer than two weeks during the growing season. (attach an explanation of the basis for your conclusions).

☐ ☐ The soil meets the Corps of Engineers regional criteria as a VERY POORLY DRAINED SOIL* and there is no evidence of altered hydrology.

☐ ☐ The soil meets the Corps of Engineers regional criteria as a POORLY DRAINED SOIL* and there is no evidence of altered hydrology.

☐ ☐ The soil meets the Corps of Engineers regional criteria as a SOMEWHAT POORLY DRAINED SOIL that has either of the following two characteristics*:

Yes NO

☐ ☐ 1. Within 6 inches of the soil surface there are:

Yes No

☐ ☐ a. soil mottles within an A or Ap horizon and the subsoil is mottled throughout; OR

☐ ☐ b. common to many, distinct or prominent mottles with a matrix of chroma 3 or less; OR

☐ ☐ c. distinct or prominent oxidized rhizospheres and the subsoil is mottled throughout.

☐ ☐ 2. Within 24 inches of the soil surface, there are mottles which are common to many, distinct or prominent, and that are chroma 2 or less, and one of the following:

Yes No

☐ ☐ a. In the horizon that lies within 10 inches of the soil surface and directly beneath a dark** A or Ap horizon, the matrix is chroma 3 or less; the mottles are at least 10% in abundance and distinct or prominent.

☐ ☐ b. When a dark** Ap horizon is between 10 and 14 inches thick, wetness morphology may be masked by organic matter. Normally, these problem situations will be considered hydric when: i. hydrophytes are prevalent, ii. there is no evidence of altered hydrology, and iii. in the horizon that lies directly beneath the Ap horizon, the matrix color is chroma 3 or less and mottles are at least 10% in abundance and distinct or prominent.

☐ Check here and attach a description of your procedures and conclusions if one of the following options were chosen for your hydric soil determination: measured redox potentials, colormetric test for ferrous iron test ($\alpha,\alpha,-$Dipyridil), or other measurements and observations.

* Typically in New England, soils having these morphologies will be classified in an aquic suborder or an aquic subgroup in soil taxonomy.
** Note: a dark A or Ap is defined as having a value of 3 or less and a chroma of 2 or less

Remarks:

NOTE: This form reflects changes that are consistent with the substance of the Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1) January 1987

Wetland Delineation Dataform -- Version 24AUG91

DATA & DETERMINATION HYDROLOGY

NOTE:
1. Hydrology is often the most difficult feature to observe.
2. Interpretations must consider the appropriateness of the observations in light of the season, recent weather conditions, and watershed alterations, etc.
3. Interpretation of hydrology may require repeated observations over more than one season.

☐ Recorded Data:

Stream, lake or tidal gage — Identification: _____

Aerial Photograph — Identification: _____

Other — Identification: _____

☐ No Recorded Data Available

REPORT ANY OF THE FOLLOWING OBSERVATIONS:

Depth to Free Water: _____

Depth to Saturation: _____

Describe Altered Hydrology: _____

_____

☐ Inundated

☐ Saturated in upper 12 inches

☐ Water Marks

☐ Drift Lines

☐ Sediment Deposits

☐ Drainage Patterns within Wetlands

Remarks:

CONCLUSIONS

Project Title:

Delineator:

Transect: Plot: Date:

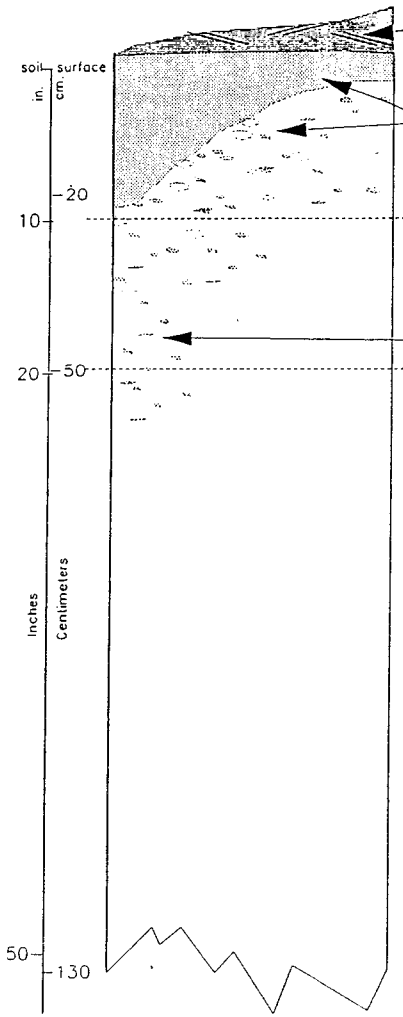
	Yes	No
Greater than 50 Percent Hydrophytes?	☐	☐
Hydric Soils Criterion Met?	☐	☐
Wetland Hydrology Present?	☐	☐

IS THIS DATAPOINT WITHIN A WETLAND? Yes ☐ No ☐

Remarks:

B3b(1) POORLY DRAINED

No spodic horizon, textures are finer than loamy fine sand in any or all subhorizons within 20 inches of the soil surface



Surface O horizons

A or Ap horizon* is less than 10 inches thick and is directly underlain by a horizon with common to many, distinct or prominent low chroma mottles, i.e. mottles are chroma 2 or less, and

at a depth less than 20 inches has a subsurface horizon that has matrix chroma 2 or less, with or without mottles.

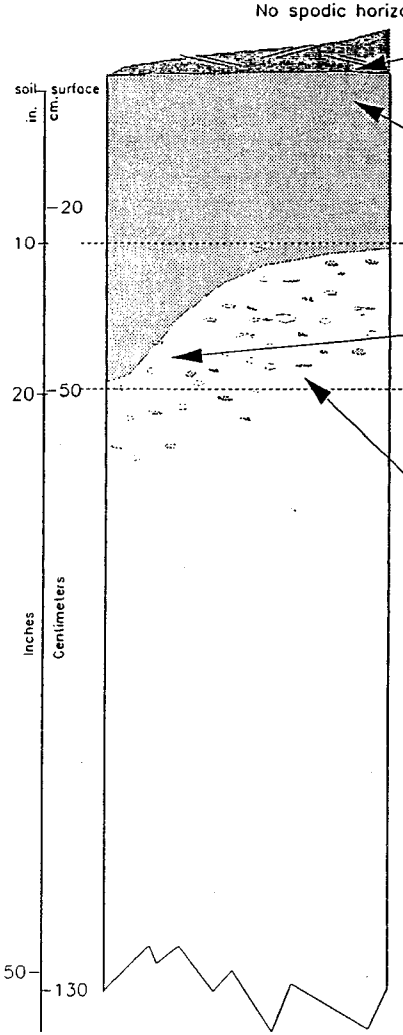
*Typically, the A or Ap are dark i.e. value of 3 or less and chroma 2 or less

OPERATIONAL DRAFT -- 14AUG91 -- CENED-OO-R/MJS

Fold or Cut Along this Line

B3b(2) POORLY DRAINED

No spodic horizon, same texture criteria as B3b(1)



Surface O horizons

A or Ap horizon* is greater than 10 inches thick and dark, i.e. matrix is value 3 or less, and chroma 2 or less.

Directly underlain by a soil horizon that has more than 10% distinct or prominent low chroma mottles (i.e. chroma 2 or less), and

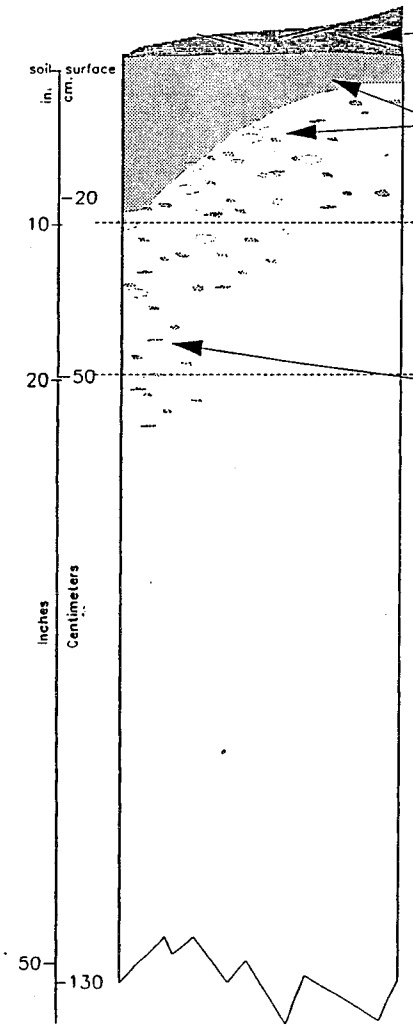
at a depth less than 20 inches has a subsurface horizon that has matrix of chroma 2 or less, with or without mottles.

*Typically, the A or Ap are dark i.e. value of 3 or less and chroma 2 or less

OPERATIONAL DRAFT -- 14AUG91 -- CENED-OO-R/MJS

B3c(1) POORLY DRAINED

No spodic horizon, textures are loamy fine sand or coarser in all subhorizons within 20 inches of the soil surface



Surface O horizons

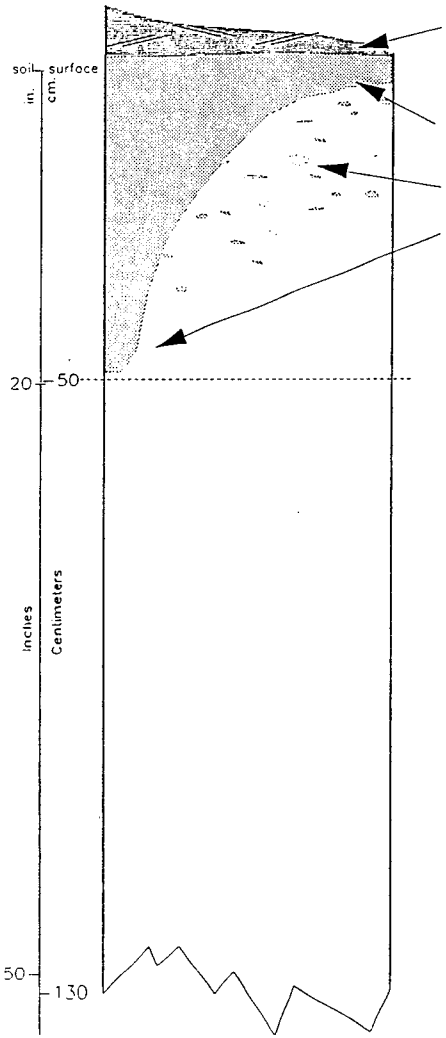
Dark A or Ap horizon is less than 10 inches thick and is directly underlain by a horizon with common to many, distinct or prominent low chroma mottles, i.e. chroma 3 or less.

A reminder: "dark" means the value is 3 or less and chroma is 2 or less.

at a depth less than 20 inches has a subsurface horizon that has matrix chroma 2 or less, with or without mottles.

B3a POORLY DRAINED

No spodic horizon, and no textural criteria



Surface O horizons are typically less than 3 inches thick, (i.e. not a mineral histic epipedon)

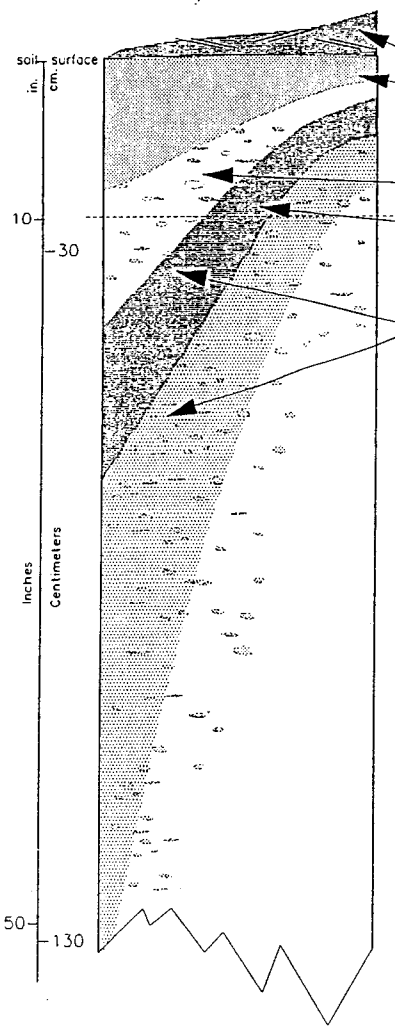
A or Ap horizon is less than 20 inches thick and is directly underlain by a horizon with either:

(1) few to common mottles with matrix chroma 2 or less, or

(2) No mottling with matrix chroma 1 or less.

B2 POORLY DRAINED

Spodosol with textures that are loamy fine sand or coarser in all subhorizons within 20 inches of the soil surface, and



Surface O horizons

A or Ap horizon

Has all three of the characteristics listed below, with one of them occurring within 10 inches of the soil surface.

a. Mottles in the (E) albic horizon (If the horizon wasn't obliterated!)

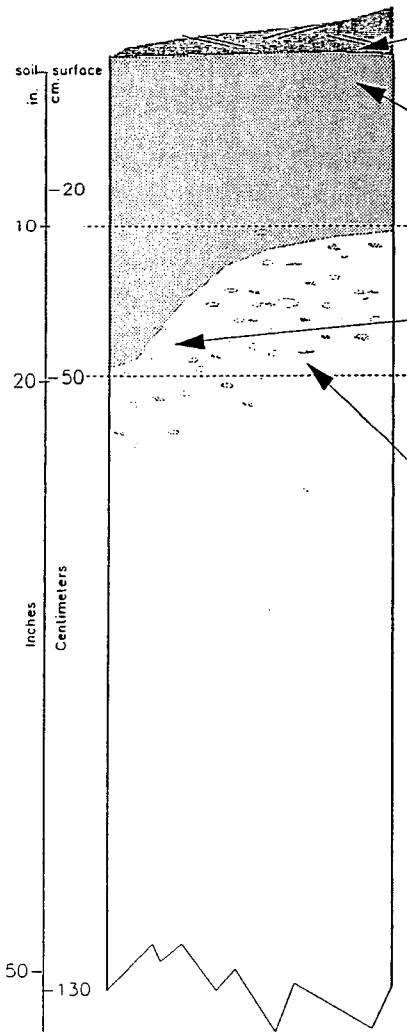
b. Organic-rich spodic horizon (Bh) greater than 2 inches thick with matrix colors of value and chroma of 3 or less.

c. Within the upper part of the spodic horizon or directly below the Bh horizon, the mottles are common to many, distict or prominent.

NOTE: The difference between this and B1 are related to texture and the thickness of the Bh.

B3c(2) POORLY DRAINED

No spodic horizon, same texture criteria as B3c(1)



Surface O horizons

A or Ap horizon* is greater than 10 inches thick and matrix is value 3 or less, and chroma 2 or less.

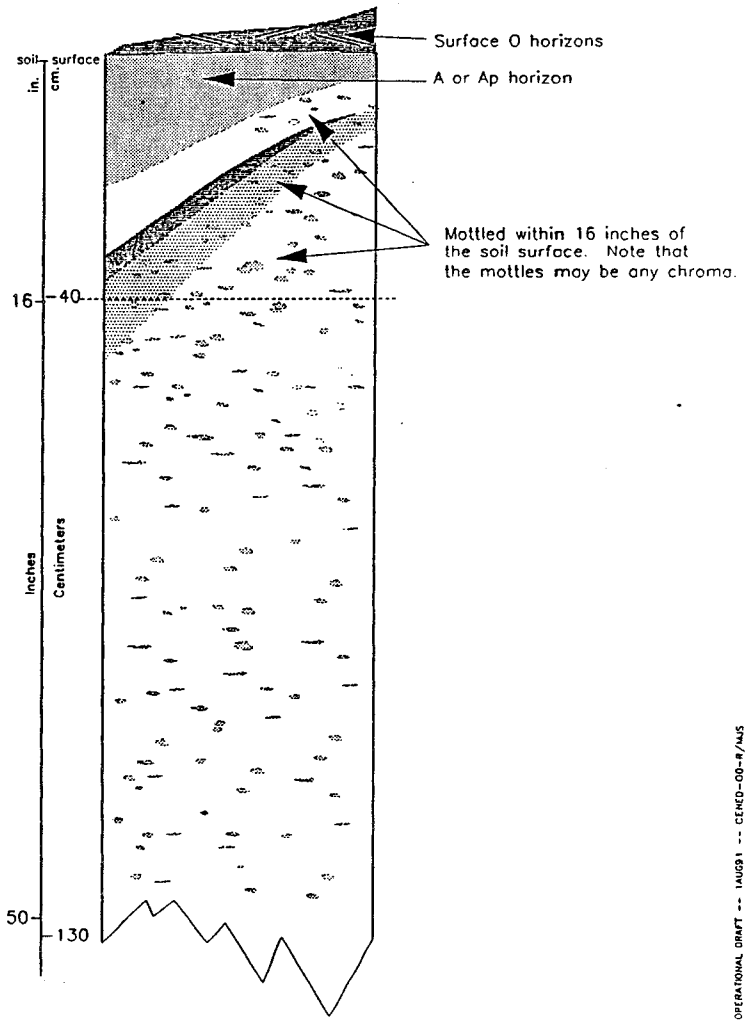
Directly underlain by a soil horizon that has more than 10% distinct or prominent low chroma mottles (i.e. chroma 3 or less), and

at a depth less than 20 inches has a subsurface horizon that has matrix of chroma 3 or less, with or without mottles.

*Typically, the A or Ap are dark i.e. value of 3 or less and chroma 2 or less

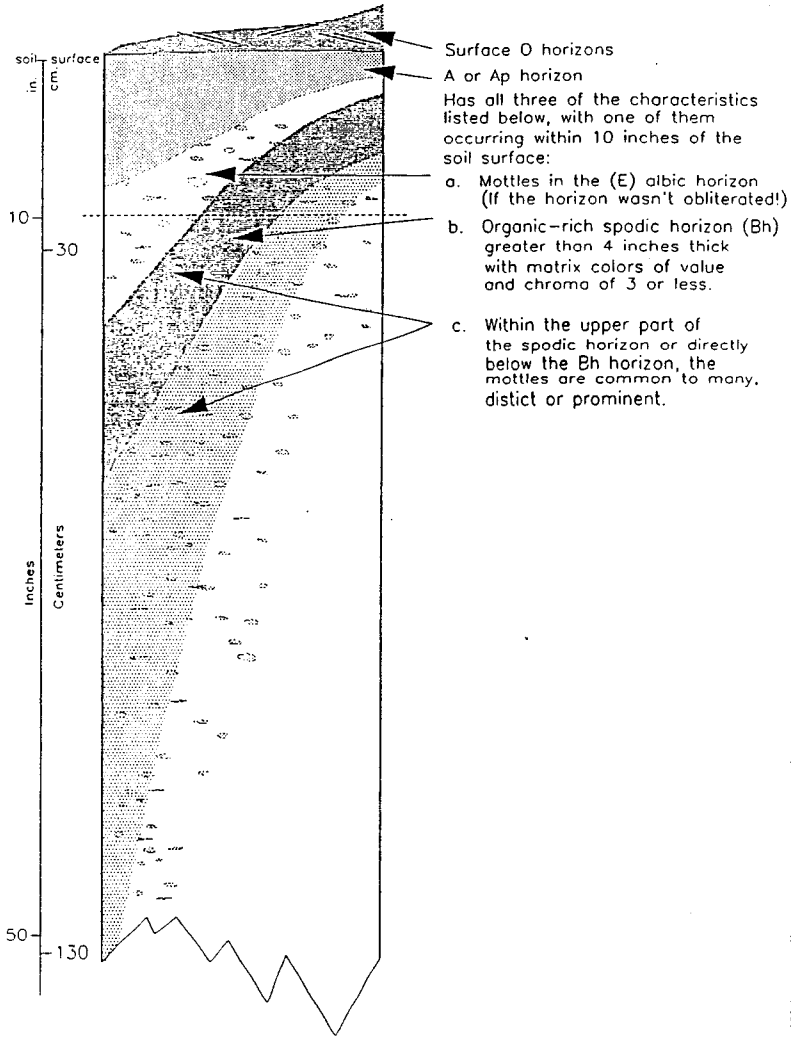
C1 SOMEWHAT POORLY DRAINED

Spodosols, and no texture criteria
(Both aquic and udic soils may be included)

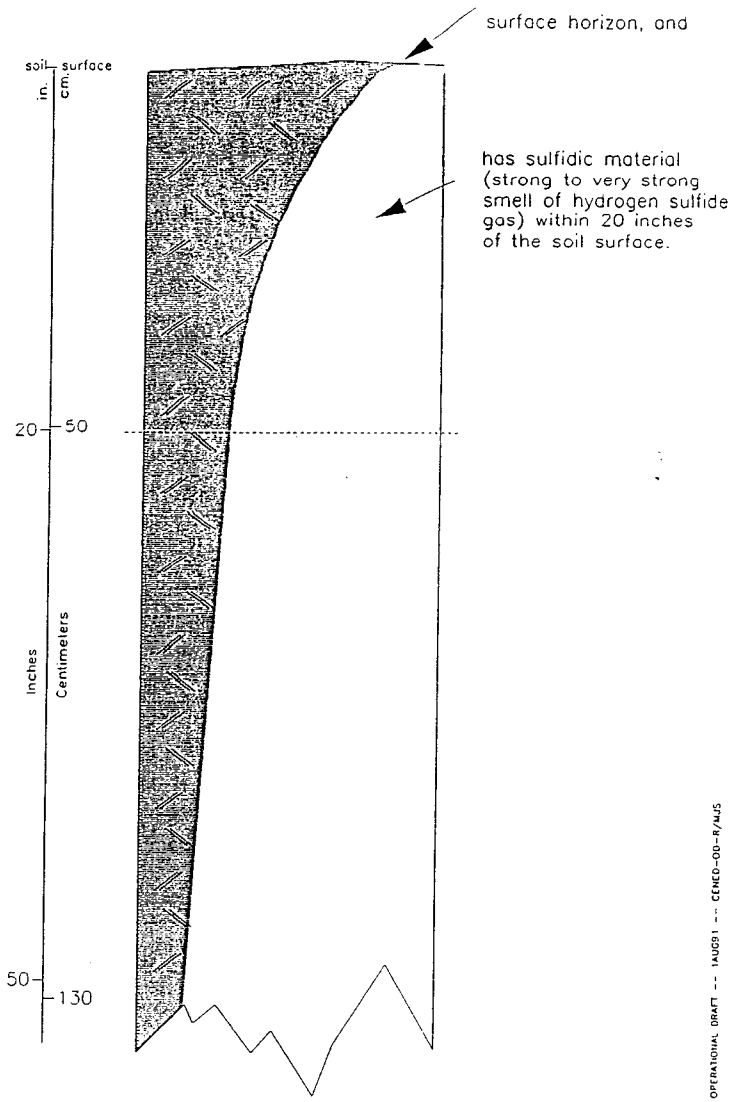


B1 POORLY DRAINED

Spodosol with textures that are finer than loamy fine sand in any or all subhorizons within 20 inches of the soil surface, and

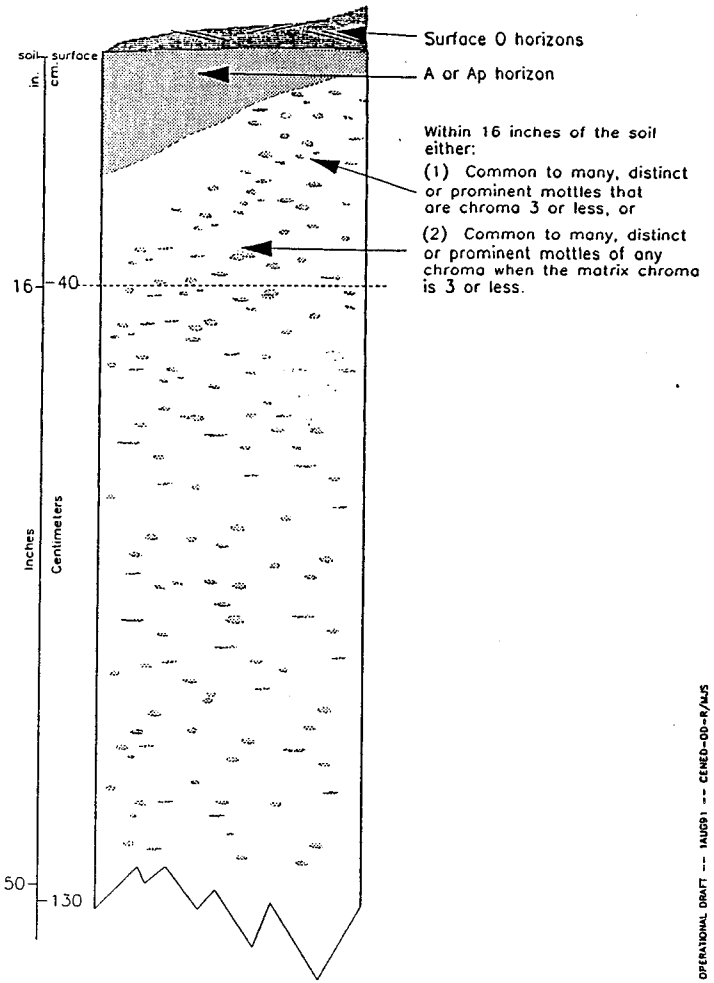


A4 VERY POORLY DRAINED

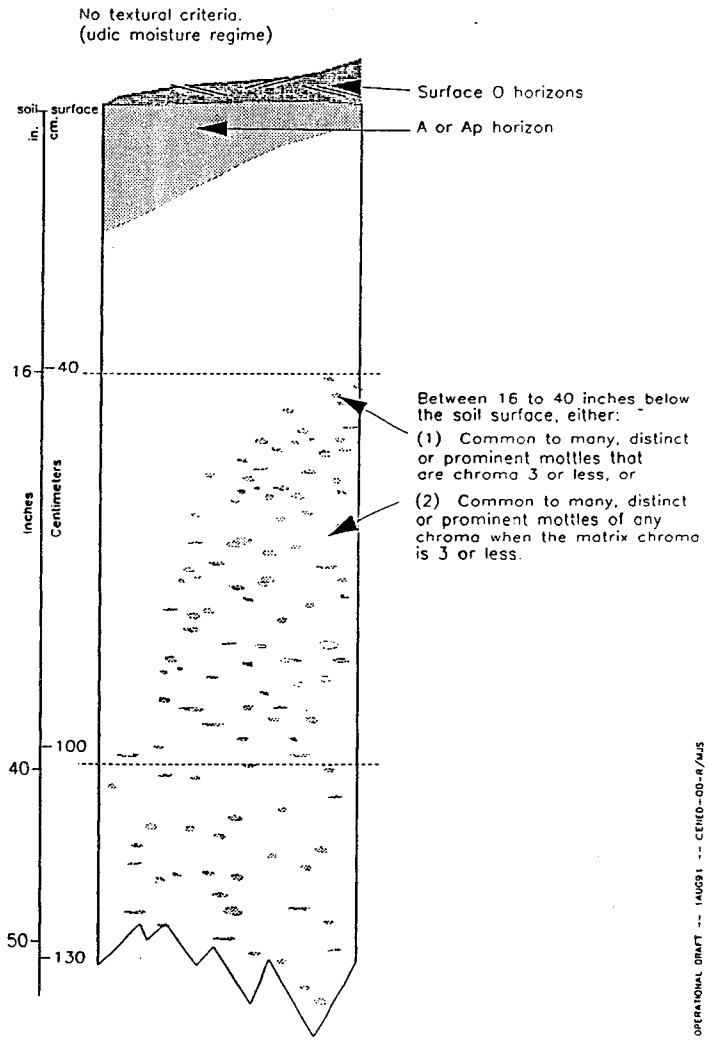


C2 SOMEWHAT POORLY DRAINED

No spodic horizon, and no textural criteria.
(Both aquic and udic soils may be included)

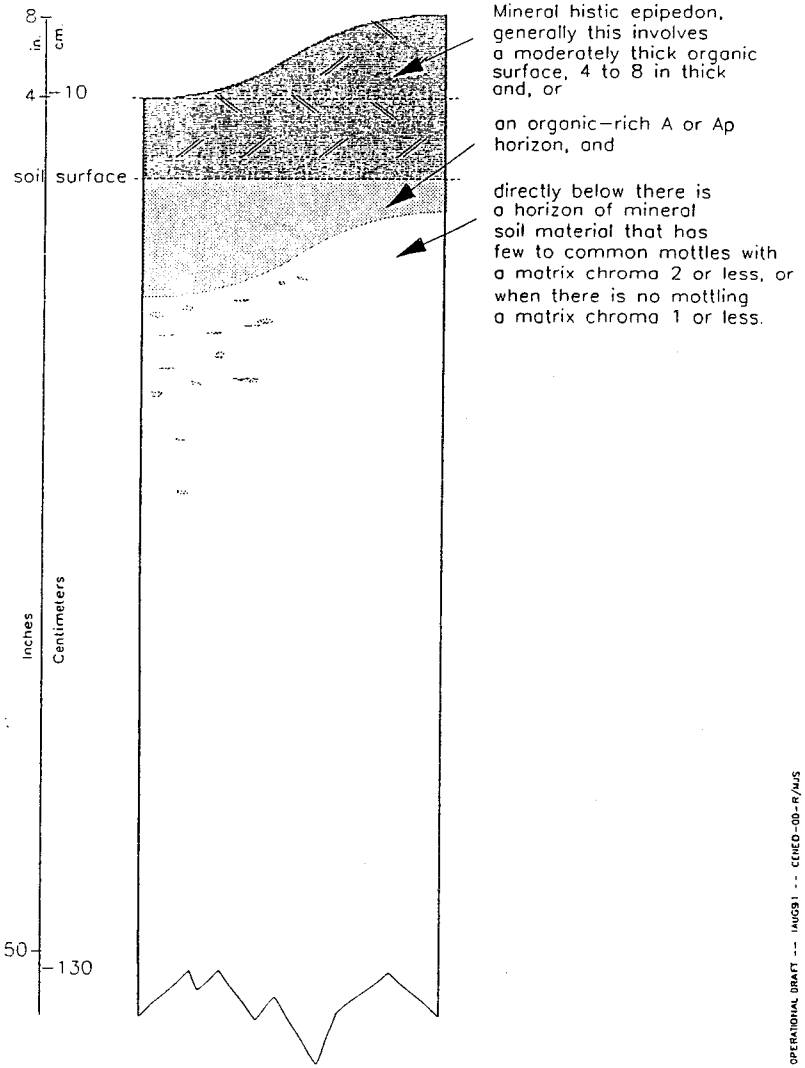


D MODERATELY WELL DRAINED



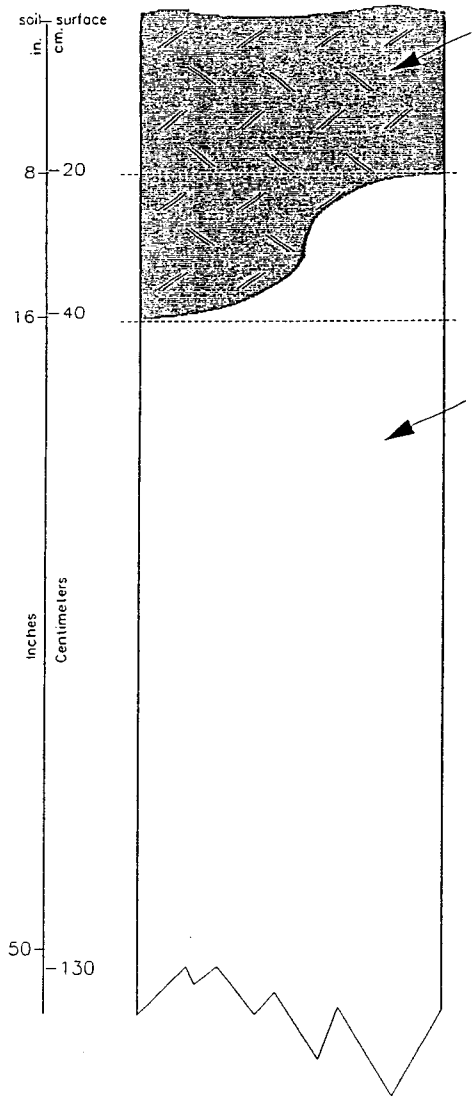
OPERATIONAL DRAFT -- 14AUG91 -- CENED-OD-R/WJS

A3 VERY POORLY DRAINED



OPERATIONAL DRAFT -- 14AUG91 -- CENED-OD-R/WJS

A2 VERY POORLY DRAINED

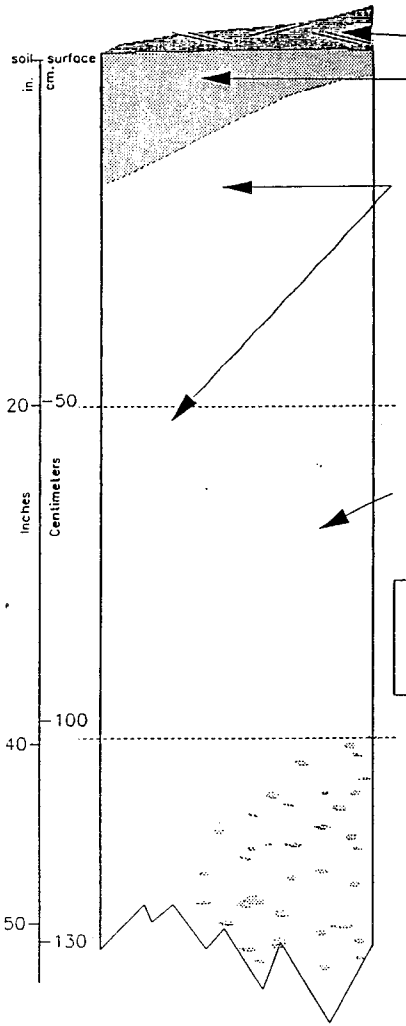


Histic epipedon, generally this involves a thick organic surface that is 8 to 16 in. thick,

no specific morphological or color criteria for the underlying mineral material, but some wetness features should be documented.

E WELL DRAINED

Fine textured materials
(udic moisture regime)



Surface O horizons

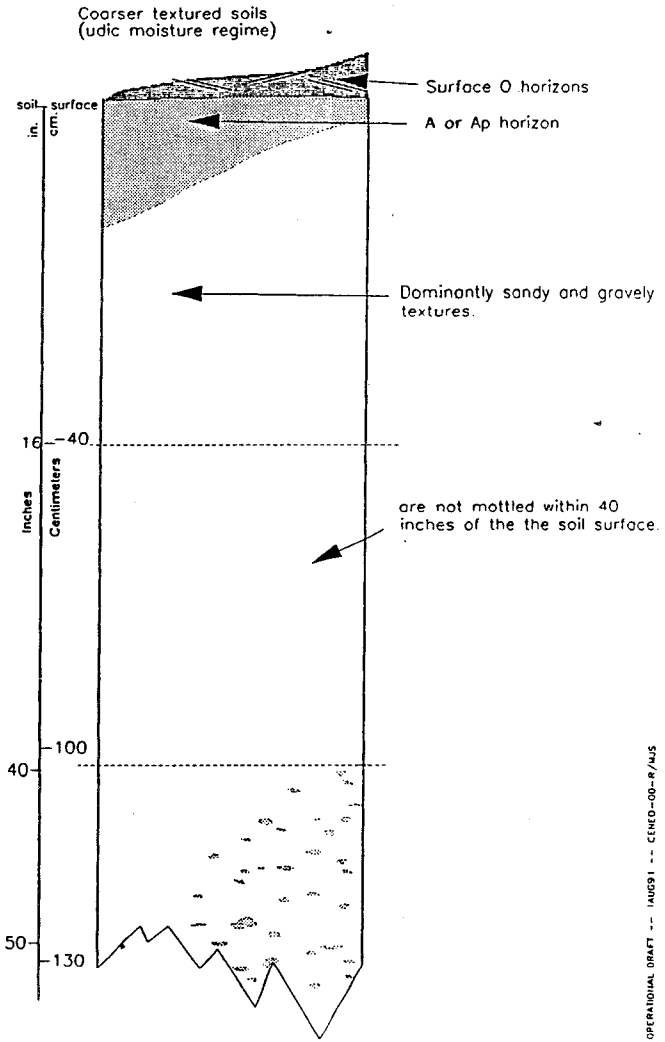
A or Ap horizon

Textures are finer than loamy fine sand that extend to a depth greater than 20 inches from the soil surface.

Typically, not mottled within 40 inches of the the soil surface; however, mottles may be found that do not meet abundance, contrast or chroma requirements of the Moderately Well Drained Soil

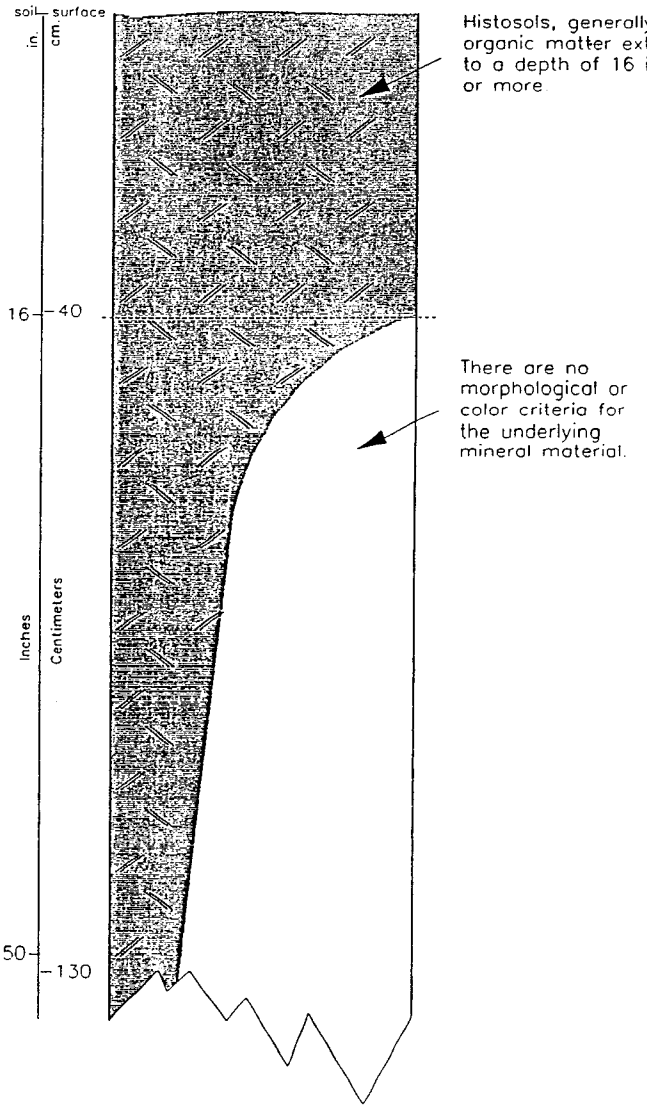
Faint mottles may be associated with the borders between layers of contrasting textures or directly overlying a restrictive layer, such as in a compact basal till.

F SOMEWHAT EXCESSIVELY TO EXCESSIVELY DRAINED SOILS



OPERATIONAL DRAFT -- 14AUG91 -- CENED-OO-R/NJS

A1 VERY POORLY DRAINED

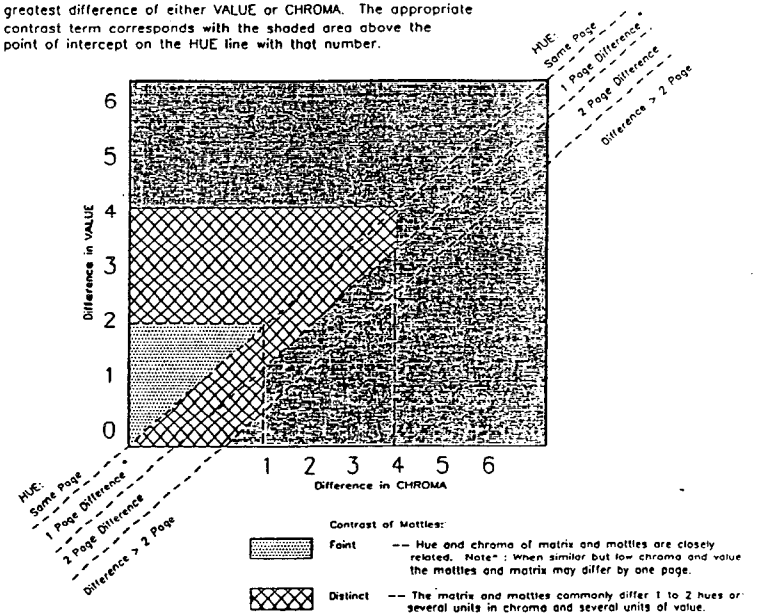


OPERATIONAL DRAFT -- 14AUG91 -- CENED-OO-R/NJS

CONTRAST OF MOTTLES

For use with Munsell Color Charts

Directions: First, select the number of pages between the Hue of the matrix and the HUE of the mottle. Next, determine the greatest difference of either VALUE or CHROMA. The appropriate contrast term corresponds with the shaded area above the point of intercept on the HUE line with that number.



Contrast of Mottles:

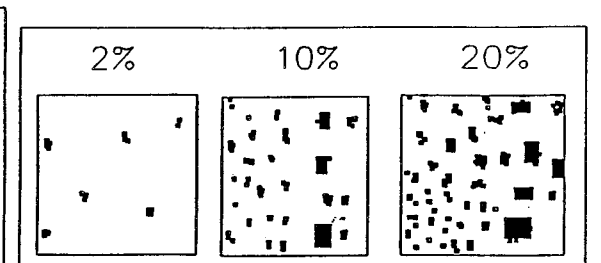
Faint -- Hue and chroma of matrix and mottles are closely related. Note* : When similar but low chroma and value the mottles and matrix may differ by one page.

Distinct -- The matrix and mottles commonly differ 1 to 2 hues or several units in chroma and several units of value.

Prominent -- The matrix and mottles commonly differ several units in hue and/or several units in value and chroma.

CENED-OD-R/mrs 1Mar91

ABUNDANCE OF MOTTLES



FEW
Less than 2%

COMMON
Abundance ranges from 2% to 20%

MANY
More than 20%

GUIDELINES FOR SOIL DRAINAGE CLASS DETERMINATION
used for Section 404 of Clean Water Act Jurisdictional Interpretations by
U.S. Army Corps of Engineers, New England Division
-- OPERATIONAL DRAFT --
[Version 27Feb91]

The range of soil profile conditions are illustrated on the pages following the entire text. Above each stylized drawing there are large letters and numbers corresponding to the paragraphs in the text. The full range of conditions that are described in the text is represented by vertical section through each profile.

A. **VERY POORLY DRAINED SOILS** are soils that have an aquic moisture regime and one of the following:

1. Organic soil materials that extend from the soil surface[a] to a depth of 16 or more inches (i.e. Histosols).
2. Organic soil materials that extend from the soil surface to a depth of 8 to 16 inches (i.e. histic epipedon).
3. A mineral histic epipedon (e.g. organic surface layers that are 4 to 8 inches thick and/or have an organic-rich A or Ap horizon) and, in the soil horizon that lies directly under an O, A, or Ap horizon there are few to common mottles with the matrix chroma[b] of 2 or less or, if there are no mottles in this underlying layer, the matrix chroma is 1 or less.
4. Sulfidic materials[c] within 20 inches of the soil surface.

B. **POORLY DRAINED SOILS** are soils that have an aquic moisture regime and one of the following:

1. A spodic horizon and a texture that is finer than loamy fine sand in some or all subhorizons within 20 inches of the soil surface; and have all the following characteristics, with one of these characteristics evident within 10 inches of the soil surface:

   a. Mottles within the albic horizon.[d]
   b. Organic-rich spodic (Bh) horizon greater than 4 inches thick with matrix colors of value and chroma of 3 or less.
   c. Mottles[e] that are common to many, distinct or prominent, are within the upper part of the spodic horizon or are directly below the organic-rich (Bh) horizon.

2. A spodic horizon and a texture that is loamy fine sand or coarser in all subhorizons within 20 inches of the soil surface; and have all the following characteristics, with one these characteristics evident within 10 inches of the soil surface:

   a. Mottles within the albic horizon.[d]
   b. Organic-rich spodic (Bh) horizon greater than 2 inches thick with matrix colors of value and chroma of 3 or less.
   c. Mottles[e] that are common to many, distinct or prominent, are within the upper part of the spodic horizon or are directly below the organic-rich (Bh) horizon.

3. Do not have a spodic horizon and have one of the following:

   a. Any soil texture, and the matrix of the soil horizon which is within 20 inches of the surface and directly underlying an O, A, or Ap horizon, is chroma 2 or less when mottles are few to common; or if there are no mottles in this horizon, the matrix chroma is 1 or less.

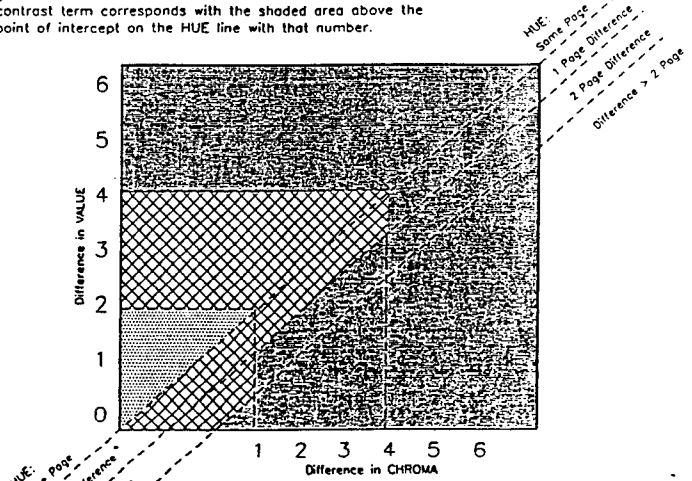
   b. Within 20 inches of the soil surface, both the texture is finer than loamy fine sand in some or all subhorizons, and there is a subsurface horizon with a matrix color of chroma 2 or less, and one of the following:
   (1) In the soil horizon directly underlying an A or Ap horizon and within 10 inches of the soil surface, there are mottles that are common to many, distinct or prominent, and that are chroma 2 or less.
   (2) In the soil horizon directly underlying a thick, dark A or Ap horizon[f], there are mottles that are distinct or prominent, greater than 10% in abundance and that are chroma 2 or less.

   c. Within 20 inches of the soil surface, the texture is loamy fine sand or coarser in all subhorizons, and there is a subsurface horizon with a matrix color of chroma of 3 or less, and one of the following:
   (1) In the soil horizon directly underlying a dark[g] A or Ap horizon and within 10 inches of the soil surface, there are mottles that are common to many, distinct or prominent, and that are chroma 3 or less.
   (2) In the soil horizon directly underlying a thick, dark A or Ap horizon[f], there are mottles that are distinct or prominent, greater than 10% in abundance, and that are chroma 3 or less.

CONTRAST OF MOTTLES

For use with Munsell Color Charts

Directions: First, select the number of pages between the Hue of the matrix and the HUE of the mottle. Next, determine the greatest difference of either VALUE or CHROMA. The appropriate contrast term corresponds with the shaded area above the point of intercept on the HUE line with that number.

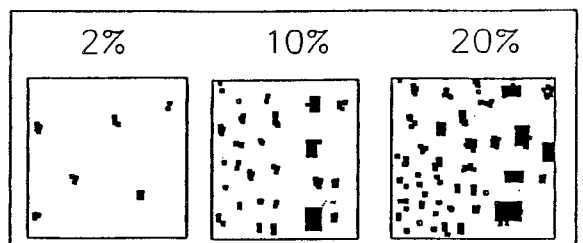


Contrast of Mottles:

- Faint — Hue and chroma of matrix and mottles are closely related. Note* : When similar but low chroma and value the mottles and matrix may differ by one page.
- Distinct — The matrix and mottles commonly differ 1 to 2 hues or several units in chroma and several units of value.
- Prominent — The matrix and mottles commonly differ several units in hue and/or several units in value and chroma.

CENED-OD-P/mrg 1Mar91

ABUNDANCE OF MOTTLES



FEW
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COMMON
Abundance ranges from 2% to 20%

MANY
More than 20%

GUIDELINES FOR SOIL DRAINAGE CLASS DETERMINATION
used for Section 404 of Clean Water Act Jurisdictional Interpretations by
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-- OPERATIONAL DRAFT --
[Version 27Feb91]

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A. **VERY POORLY DRAINED SOILS** are soils that have an aquic moisture regime and one of the following:

1. Organic soil materials that extend from the soil surface[a] to a depth of 16 or more inches (i.e. Histosols).
2. Organic soil materials that extend from the soil surface to a depth of 8 to 16 inches (i.e. histic epipedon).
3. A mineral histic epipedon (e.g. organic surface layers that are 4 to 8 inches thick and/or have an organic-rich A or Ap horizon) and, in the soil horizon that lies directly under an O, A, or Ap horizon there are few to common mottles with the matrix chroma[b] of 2 or less or, if there are no mottles in this underlying layer, the matrix chroma is 1 or less.
4. Sulfidic materials[c] within 20 inches of the soil surface.

B. **POORLY DRAINED SOILS** are soils that have an aquic moisture regime and one of the following:

1. A spodic horizon and a texture that is finer than loamy fine sand in some or all subhorizons within 20 inches of the soil surface; and have all the following characteristics, with one of these characteristics evident within 10 inches of the soil surface:

   a. Mottles within the albic horizon.[d]
   b. Organic-rich spodic (Bh) horizon greater than 4 inches thick with matrix colors of value and chroma of 3 or less.
   c. Mottles[e] that are common to many, distinct or prominent, are within the upper part of the spodic horizon or are directly below the organic-rich (Bh) horizon.

2. A spodic horizon and a texture that is loamy fine sand or coarser in all subhorizons within 20 inches of the soil surface; and have all the following characteristics, with one these characteristics evident within 10 inches of the soil surface:

   a. Mottles within the albic horizon.[d]
   b. Organic-rich spodic (Bh) horizon greater than 2 inches thick with matrix colors of value and chroma of 3 or less.
   c. Mottles[e] that are common to many, distinct or prominent, are within the upper part of the spodic horizon or are directly below the organic-rich (Bh) horizon.

3. Do not have a spodic horizon and have one of the following:

   a. Any soil texture, and the matrix of the soil horizon which is within 20 inches of the surface and directly underlying an O, A, or Ap horizon, is chroma 2 or less when mottles are few to common; or if there are no mottles in this horizon, the matrix chroma is 1 or less.

   b. Within 20 inches of the soil surface, both the texture is finer than loamy fine sand in some or all subhorizons, and there is a subsurface horizon with a matrix color of chroma 2 or less, and one of the following:
   (1) In the soil horizon directly underlying an A or Ap horizon and within 10 inches of the soil surface, there are mottles that are common to many, distinct or prominent, and that are chroma 2 or less.
   (2) In the soil horizon directly underlying a thick, dark A or Ap horizon[f], there are mottles that are distinct or prominent, greater than 10% in abundance and that are chroma 2 or less.

   c. Within 20 inches of the soil surface, the texture is loamy fine sand or coarser in all subhorizons, and there is a subsurface horizon with a matrix color of chroma of 3 or less, and one of the following:
   (1) In the soil horizon directly underlying a dark[g] A or Ap horizon and within 10 inches of the soil surface, there are mottles that are common to many, distinct or prominent, and that are chroma 3 or less.
   (2) In the soil horizon directly underlying a thick, dark A or Ap horizon[f], there are mottles that are distinct or prominent, greater than 10% in abundance, and that are chroma 3 or less.

SOIL INTERPRETATION REFERENCES:

1. Soil Taxonomy:

Keys to Soil Taxonomy 4th Ed.
SMSS Technical Monograph No. 19
Virginia Polytechnical Institute
and State University
Mail to: International Soils
$12 Check -> Crop & Soil Environmental
Sciences Department
Virginia Tech
Blacksburg, VA 24061-0404

Keys to The Taxonomic Classification of New England Soils
$14 -> Michael Cuomo
22 Jewett Avenue
S. Berwick, ME 03908

2. Published Soil Surveys:

Connecticut:
USDA-SCS
16 Professional Park Road
Storrs, CT 06268

Maine:
USDA- SCS Office Building
University of Maine
Orono, ME 04473

Massachusetts:
USDA-SCS
451 West Street
Amherst, MA 01002

New Hampshire:
USDA-SCS
Federal Building
Durham, NH 03824

Rhode Island:
USDA-SCS
46 Quaker Lane
West Warwick, RI 02893

Vermont:
USDA-SCS
69 Union Street
Winooski, VT 05404

3. Horizons, Mottles, USDA Texture and Other Appropriate Features:

Soil Survey Manual
Chapter 3
"Examination and Description of Soils"

4. Soil Colors:

Munsell Soil Color Charts
Macbeth Division of
Kollmorgen Corporation
2441 North Calvert Street
Baltimore, MD 21218

IMPORTANT RESOURCE INFORMATION

Aerial Photography -- Sources of Photos

ASCS Aerial Photo Field Office
P.O. Box 30010
Salt Lake City, VT 84130
801-524-5856

USCA EROS Data Center
Sioux Falls, SD 57198
605-594-6151

Aerial Photography -- List of Sources

USGS National Cartographic Information Center
507 National Center
Reston, VA 22092
703-860-6045

Wetland Plant Lists

Publications Request Manager
National Ecology Research Center
U.S. Fish and Wildlife Service
2627 Redwing Road, Creekside One
Fort Collins, CO 80526-2899
303-226-9300

Porter B. Reed, Jr.
U.S. Fish and Wildlife Service
National Wetlands Inventory
9720 Executive Center Drive
Suite 101, Monroe Building
St. Petersburg, FL 33702

Hydric Soils List

National Technical Committee
for Hydric Soils
Soil Conservation Service
P.O. Box 2890
Washington, DC 20013

Hydric Soils of New England

UMass Cooperative Extension
Bulletin Center/Cottage A
Thatcher Way
University of Massachusetts
Amherst, MA 01003
Cost: $8.00

National List of Scientific Plant Names

USDA Soil Conservation Service
Office of Ecological Sciences
P.O. Box 2890
Washington, DC 20013
202-4470-2587
Publ. No. SCS-TP-159 (1982)

Keys to Soil Taxonomy

International Soils
Department of Agronomy
Bradfield Hall
Cornell University
Ithaca, NY 14853
Cost: $12.00

Federal Manual for Identifying and Delineating Jurisdictional Wetlands

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402
GPO Doc. No. 024-010-00-683-8
202-783-3238 Cost: $7.50

Corps of Engineers Permit Regulations, 33 CFR 320-330 Federal Register, Nov 13, 1986

U.S. Government Printing Office
Superintendent of Documents
Washington, DC 20402

National Wetland Inventory Map Distribution Outlets

CT: Ken Metzler
Dept of Env Protection
Natural Resources Center
165 Capitol Ave, Room 553
Hartford, CT 06106
203-556-3548

ME: Robert Johnston
ME Geological Survey
State House Station 22
Augusta, ME 04333
207-289-2801

RI: Dept of Envir Mgmt
Freshwater Wetlands Section
291 Promenade Street
Providence, RI 02908
401-277-6820

MA: Dennis Swartwout
Cartographic Information Research Center
102-D Hasbrouck Lab
University Of Massachusetts
Amherst, MA 01003
413-545-0359

NH: James McLaughlin
Office of State Planning
State of New Hampshire
2 1/2 Beacon Street
Concord, NH 03301
603-271-2155

VT: Carl Pagel
Vermont Dept of Water Resources
Waterbury, VT 05602
802-244-6951

Other States: 813-893-3863 (for federal agencies; maps are free)
1-800-872-6277 (for others; maps cost $1.75 for paper, $3.50 for mylar, and $6.50 for shipping)